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ANNUAL REPORT

AND

TRANSACTIONS

OF THE

PLYMOUTH INSTITUTION

AND

Devon & Cornwall Natural History Society.

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VOL. IX. PART III. 1886-87.

PLYMOUTH:
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1887.

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OFFICERS OF THE INSTITUTION

SESSION 1886-87.

President.

Mr. S. CATER.

Vice-Presidents.

Mr. F. BRENT, F.S.A.
Rev. Prof. CHAPMAN, LL.D.
Mr. W. SQUARE, F.R.C.S., F.R.G.S.
Mr. R. N. WORTH, F.G.S.

Treasurers.

Mr. S. CATER.
Mr. E. G. BENNETT.

Secretaries.

Mr. J. C. INGLIS, C.E.
Mr. H. PENROSE PRANCE.

Members of Council.

Mr. F. H. BALKWILL.
Rev. W. S. DICKSON, LL.D.
Mr. D. D. DOBELL.
Mr. D. SLATER, M.A.
Mr. P. MITCHELL.
Dr. J. MERRIFIELD, F.R.A.S., F.R.M.S.
Dr. R. OXLAND, F.C.S.
Mr. J. BROOKING ROWE, F.S.A., F.L.S.
Mr. W. G. TWEEDY, B.A.
Mr. F. J. WEBB, F.G.S.

The above form the Council.

Curators.

Library—Mr. J. BROOKING ROWE, F.S.A., F.L.S.
Building—Mr. J. C. INGLIS, C.E.
Fine Arts—Mr. P. MITCHELL, R.I.

Museum Curators.

Anthropology—Mr. F. BRENT, F.S.A.
Mammalia—Mr. F. H. BALKWILL.
Birds—Mr. H. M. EVANS.
Fishes—Mr. G. JACKSON, F.R.C.S.
Invertebrata—Mr. G. BIGNELL, F.E.S. Mr. F. BRENT, F.S.A. Mr. R. N. WORTH, F.G.S.
Botany—Mr. D. D. DOBELL.
Mineralogy—Dr. R. OXLAND, F.C.S.
Geology—Mr. F. J. WEBB, F.G.S.
Petrology—Mr. R. N. WORTH, F.G.S.

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LIST OF MEMBERS.

HONORARY MEMBERS.

Elected.	Name.	Address.
1865	Adams, J. C., D.C.L., F.R.A.S.	The Observatory, Cambridge.
1877	Beal, Rev. Professor, B.A., M.R.A.S.	Wark Rectory, Hexham.
1887	Dallinger, Rev. W. H., LL.D., F.R.S., etc.,	Wesley College, Sheffield.
1874	Froude, James Anthony, M.A.	5, Onslow Gardens, London, W.
1859	Gibbs, F. W., Q.C., C.B.,	24, Mount Street, Grosvenor Square, London, W.
1877	Günther, Dr. A., F.R.S., F.L.S., F.Z.S.	British Museum, London.
1887	Lankester, Ray, Professor, F.R.S.	North Bank, London, N.W.
1865	Lubbock, Sir John, Bart., D.C.L., F.R.S., F.L.S.,	High Elms, Kent.
1874	Pengelly, W., F.R.S., F.G.S.	Lamorna, Torquay.
1859	Scrivener, Rev. F. H. A., M.A., LL.D.,	Hendon, Middlesex.
1875	Temple, Right Rev. Dr., Bishop of London,	The Palace, Fulham.
1865	Vivian, Edward, M.A.	Torquay.
1872	Weymouth, R. F., D.LIT.	33, Alfred Road, Acton, London.
1872	Worth, R. N., F.G.S.	4, Seaton Road.

LIFE MEMBERS.

1855	Alger, J.	Sydney, Australia.
1863	Alger, W. H.	Widey Court, near Plymouth.
1856	Bartlett, G.	Plymouth.

CORRESPONDING MEMBERS.

1858	Ormerod, G. W., M.A., F.G.S.	Woodway, Teignmouth.
1863	Vicary, W., F.G.S.	Exeter.
1887	Iago, Rev. W., B.A., L.S.A.	Bodmin.

LECTURING MEMBERS.

1868	Adams, W.	Frankfort Street.
1881	Aldridge, Charles, M.D.	Plympton House, Plympton.
1860	Anthony, Rev. Professor, M.A.	13, Woodland Terrace.
1884	Babb, H. R.	21, Portland Square.
1864	Balkwill, Francis Hancock	Princess Square.
1882	Bampton, Augustus H., M.D.	North Devon Place.
1852	Bate, C. Spence, F.R.S.	Mulgrave Place.
1863	Bennett, E. G.	10, Woodland Terrace.
1826	Bennett, J. N.	Windsor Villas.
1884	Bignell, George C., F.E.S.	7, Clarence Place, Stonehouse.
1861	Brent, Francis, F.S.A.	19, Clarendon Place.
1885	Brenton, W. H.	8, Westbury Terrace, North Road.
1862	Briggs, Thomas Rider Archer, F.L.S.	Fursdon, Knackersknowle, near Plymouth.

LECTURING MEMBERS—*continued.*

Elected.	Name.	Address.
1881	Burnard, Charles F.	Chatsworth Lodge, Compton Park Road.
1886	Burnard, Robert	3, Hillsborough, Mannamead.
1851	Cater, Samuel	North Devon Place.
1876	Chapman, Rev. Professor, LL.D., M.A.	Western College, Tavistock Road,
1880	Clarke, Sir Edward, Q.C., M.P.,	Huntingdon Lodge, Peckham-rd., London.
1851	Collier, W. F.	Woodtown, Horrabridge.
1876	Collier, Miss Bertha Cycill	Woodtown, Horrabridge.
1876	Collier, Charles Calmady	Woodtown, Horrabridge.
1884	Collier, G. B., B.A.	Woodtown, Horrabridge.
1877	Coney, Rev. Thomas, M.A.	4, Wingfield Villas, Stoke.
1885	Crealock, W. S., R.N.	3, Houndiscombe Place.
1882	Debnam, Alfred R.	10, Higher Portland Place, Stoke.
1884	Dickson, Rev. W., LL.D.	53, Haddington Road, Stoke.
1884	Dobell, Douglas D.	1, Auburn Place.
1884	Edlin, Edward Holberton, M.R.C.S. ENG., F.R.C.S. EDIN.,	1, Braidwood Ter.
1880	Edmonds, Robert G.	Mount Drake.
1882	Evans, H. Montague	4, South Devon Place.
1884	Evans, Rev. G., M.A.	8, Washington Terrace, Alexandra Road.
1884	Evans, Godfrey	4, Rochester Terrace.
1874	Fouracre, John T.	Chapel Street, Stonehouse.
1875	Fox, Francis E., B.A., F.R.G.S.	Uplands, Tamerton Foliot.
1868	Fox, R. R.	Westbrook, Tamerton.
1851	Harper, T., M.R.C.S.	1, Gibbon Street.
1886	Harvey, T. H.	Cattedown and Fareham Place.
1886	Heape, Walter, M.A.	5, Holyrood Place.
1852	Hine, James, F.R.I.B.A.	Mulgrave Place.
1867	Hingston, C. Albert, M.D.	2, Sussex Terrace.
1875	Hughes, R. H., M.A., M.B., M.R.C.S.	12, Lockyer Street.
1876	Inglis, James C., C.E.	1, Buckland Terrace.
1881	Inskip, Capt. G., R.N., F.R.G.S.	Torrington House, North Road.
1868	Jackson, George, F.R.C.S.	1, St. George's Terrace.
1851	Jago, George	Cobourg Street.
1882	Jago, C. S., F.R.G.S.	Cobourg Street.
1882	Jewers, Arthur J., F.S.A.	6, Seaton Terrace, Mutley.
1885	McCarthy, R. H.	H.M. Customs, Parade.
1874	Merrifield, John, LL.D., F.R.A.S., F.R.M.S.,	7, Hobart Terrace.
1862	Mitchell, Philip, R.I.	Bedford Terrace.
1867	Monkswell, The Right Hon. Lord	7, Chelsea Embankment, London.
1870	Morley, The Right Hon. the Earl of,	31, Princess Gardens, South Kensington, London, S.W.
1861	Mount Edgcumbe, The Right Hon. the Earl of,	Mount Edgcumbe, Devonport.
1885	Nicolls, Edward	3, Holyrood Terrace.
1884	Norman, John G.	Sea View Terrace.
1851	Oxland, R., PH.D., F.G.S.	Portland Square.
1871	Pearse, W. H., M.D.	1, Alfred Place.
1886	Philips, Frank, F.R.C.I.	7, West Hoe Terrace.
1880	Power, W.	H.M. Customs, Parade.
1883	Prance, H. Penrose	7, Athenæum Terrace.
1859	Prowse, A. P.	Yennadon, Horrabridge.

LECTURING MEMBERS—*continued.*

Elected.	Name.	Address.
1884	Radford, Charles H.	37, Bedford Street.
1880	Rew, G. Gale	3, Whitefield Terrace.
1884	Rice, J.	21, Walker Terrace.
1875	Rider, A., F.C.S.	4, Haddington Road, Stoke.
1857	Risk, Rev. J. Erskine, M.A.	Princess Square.
1861	Rowe, J. Brooking, F.S.A., F.L.S.	Mulgrave Street.
1886	Sexton, Louis	Portland Square.
1860	Shelly, John	Princess Square.
1875	Smith, Robert	George Street.
1867	Slater, D., M.A.	Cheveley Hall, Seymour Road.
1886	Slater, Gilbert, B.A.	Cheveley Hall, Mannamead.
1869	Square, W., F.R.C.S., F.R.G.S.	Portland Square.
1883	Square, William Joseph, F.R.C.S.	Portland Square.
1884	Square, J. Elliot, F.R.C.S.	Portland Square.
1876	Tippetts, G. E.	The Mount, Mannamead Avenue.
1885	Tremain, F.	5, King Street, Plymouth.
1865	Tweedy, W. Gage, B.A.	Athenæum Terrace.
1884	Vincent, Rev. Samuel	6, Woodland Terrace.
1885	Wade, William Cecil	5, Portland Square.
1883	Watson, G. F.	3, Walker Terrace.
1875	Webb, F. J., F.G.S.	13, Portland Villas.
1864	Weekes, Samuel, MUS. BAC.	Sussex Terrace.
1887	Wilson, W. C., M.B.	St. Aubyn Street, Devonport.
1873	Woollcombe, R. W., M.D.	St. Jean D'Acre Terrace, Stoke.
1879	Worth, R. N., F.G.S.	4, Seaton Road.
1878	Wright, W. H. K., F.R.H.S.	31, Headlands Park.
1885	Wyatt, R. C., B.A.	Clifton House Grammar School.

"The property of the Institution, the election of members, management of the concerns, and enactment of laws, are vested exclusively in the Lecturing Members."—LAW 5.

ASSOCIATES.

Adams, Benjamin, Walmer Villa.
Allport, S., 8, Houndiscombe Place, North Road.
Anderson, T. Scott, 14, Grosvenor Terrace, Mutley.
Barrett, G. R., Bank of England Place.
Barrett, J., 8, Staddon Terrace.
Bayly, John, Seven Trees.
Bayly, Robert, Torr Grove, Plymouth.
Bazeley, William, 2, Queen Anne Ter.
Beechey, Admiral, 13, St. James's Terrace.
Bellamy, G. D., Endsleigh Place.
Berry, J. P., 2, Walker Terrace.
Brendon, W. Turner, George Street.
Brown, J.P., The Abbey, Plymouth.
Browning, F., Priory Cottage, Compton.
Bulteel, Thomas, Radford, Plymouth.
Butler, Theobald, M.A., Wellington Villa, Mannamead.
Chalker, John P., 9, Crescent Place.
Chambers, Henry, 23, Clarendon Place.
Champernowne, A., F.G.S., Dartington House, Totnes.
Clark, W., 19, Portland Villas.
Coath, J., 7, Holyrood Place.
Cole, A., Bedford Terrace.
Compton, C. E., 2, Mutley Park Terrace.
Cooper, Cornelius Francis, 17, East Street, Plymouth.
Creagh, Mrs. Henrietta W., 16, Caroline Place, Stonehouse.
Daubeny, Major G. A., Naval Bank.
Derry, W., Houndiscombe House.
Deutsch, Herr, 3, Hoe Park Place.
Diment, Thomas, 8, Brunswick Terrace.
St. Germans, The Right Hon. the Earl of, St. Germans, Cornwall.
Edgcombe, F. H., 17, Kensington Terrace.

ASSOCIATES—*continued.*

Fell, Thomas, 23, Princess Square.
Fisher, C., 1, Victoria Place, Stonehouse.
Foale, William, jun., 3, Meadsfoot Terrace, Mannamead.
Foster, J. B., 4. Cambridge Street.
Fox, E., Hillside.
Gillon, Capt. W., 1st Battn. H.L.I., Raglan Barracks.
Goulding, F. H., George Street.
Greenlaw, William, Lipson Cottage.
Haite, John, C.E., Dockyard, Devonport, and 72, Durnford Street, Stonehouse.
Hall, Frederick, George Street.
Harris, Henry Vigurs, Union Street.
Hearder, H. P., Westwell Street.
Heath, William, George Street.
Hender, J., S. D. & C. Railway Office, Millbay Road.
Hill, F. N., 9, South Devon Place.
Honey, Augustine, Frankfort Street.
Hoppen, Vosper, George Street.
Hoskin, R., 16, Clarence Place, Plymouth.
Hubbard, G., J.P., Ford Park.
Hurrell, H., Peveril Park.
Jago-Trelawny, Major-Gen., Coldrenick, Cornwall.
Jago, Richard, Hallwell House, Hallwell Street.
James, Capt., R. W. Yacht Club.
James, C. H., Ingleside, Mannamead.
James, Edward, J.P., Greenbank.
James, E. H., Woodside.
James, W. C., J.P., 6, Glenside, College Road.
Jasper, Thomas, 2, Melville Place, Ford.
Jenkins, James, M.D., Nevingstone, Mannamead.
Keen, Henry, St. James's Terrace.
Kerswell, Alfred J., Ham Street.
Kerswell, Samuel, 1, Osborne Place.
Kerswill, F. J., Frankfort Street.
King, William, Hoe House.
Lampen, Major-Gen. J., 6, Alton Terrace.
Latimer, Alfred, Portland Square.
Lemann, Fred. C., Blackfriars House.
Lemon, Rev. T. W., M.A., 1, Cheltenham Place.
Linton, John, Ford Park, Plymouth.
Lovibond, James, H.M. Customs, Parade.
Mabin, Francis, 10, Union Street.
Mansfield, Chas., 39, Headlands Park.
Martin, W., Windsor Villas.
MacAndrew, J., F.L.S., Lukesland, Ivybridge.
Mitchell, T., Eton Villas.
Morrish, F. A., 2, Bedford Terrace.
Morris, Charles, Gascoyne House.
Mugford, James A., Elm Villa, Mannamead.
Page, James A., 10, Windsor Terrace.
Pagen, J. Fletcher, F.G.S., Pendower, Mannamead.
Pearse, Miss, Bedford Terrace.
Pearse, S., Royal Hotel.
Pearse, T., M.D., Flora Place.
Penrose, Richard A., 74, Durnford Street, Stonehouse.
Penson, James, 7, Boon's Place.
Philips, G., 1, Victoria Place, Stonehouse.
Picken, Samuel, 12, Hill Park Crescent.
Pode, J. Duke, J.P., Slade, Ivybridge.
Preston, H., 3, Bedford Place.
Radford, John, Bedford Street.
Randle, J., Union Street.
Rean, W. H., M.D., M.R.C.S., 25, Woodland Terrace.
Reed, W. R., General Post Office, Plymouth.
Revelstoke, The Right Hon. Lord, Membland.
Ridge, B. J., 3, Gainsborough Place.
Rodd, R. R., jun., 63, Union Street, Stonehouse.
Rooke, Samuel, 5, Westbury Terrace.
Rorie, John, M.D., Ford Park.
Roy, David, 6, Holyrood Place.
Russell, G., Hoe Park House.
Serpell, E. W., 19, Hill Park Crescent.
Smith, E. S., Old Town Street.
Stephenson, G., Old Town Street.
Stephenson, R., National and Provincial Bank of England, Devonport.
Stribley, Edwin, 3, Kobe Terrace.
Taylor, Frank, 37, Flora Street.
Taylor, J., 37, Flora Street.
Taylor, Sydney, 37, Flora Street.
Trehane, J. H., Princess Square.
Trelawny, Sir W., Bart., Trelawne.
Williams, H. J., Polperro, Cornwall.
Willoughby, J., Stafford Terrace.
Willoughby, W., The Foundry.
Wilson, J. Walter, 10, Leigham Villas.
Windeatt, John, Woodland House.
Woodhouse, Henri B. S., 15, Portland Square.

LADY ASSOCIATES.

Borland, Mrs. R., Emma Place, Stonehouse.
Cann, Miss Agnes, 20, Tavistock Road.
Canning, Miss F., 7, St. James's Terrace.
Cooper, Miss Agnes G., 12, Cheltenham Place.
Gidley, Miss, 2, St. Michael's Terrace.
Lindsey, Miss M. B., Braidwood House.
Minhinnick, Miss E. M., Portland Square.
Waghorn, Miss, 20, Hill Park Crescent.

JUNIOR ASSOCIATES.

Crowther, J. B., 1, Buckland Terrace.
Worth, R. G. H., 4, Seaton Road.

BALANCE SHEET

OF

The Plymouth Institution and Devon and Cornwall Natural History Society,

For the Year ending 1st April, 1887.

	£	s.	d.	1886 £	s.	d.
Amount of Subscriptions at £1 1s.	210	0	0	204	15	0
,, ,, at 10s. 6d.	7	7	0	9	9	0
Arrears of ditto	4	4	0	1	1	0
Rent of Hall	16	0	0	4	12	0
,, Western Counties Telephone Co.	0	1	0	0	1	0
Plymouth Art Club—Gas and Fires	1	10	0	2	0	0
Ladies' ,, ,,	0	14	0	0	12	6
Subscriptions to Museum Building	90	13	6	145	7	0
Admissions to Museum	1	6	6	1	8	6
Balance	382	15	7	405	1	9
	£714	11	7	774	7	9

	£	s.	d.	1886 £	s.	d.
Balance	405	1	9	520	18	3
Lighting and Warming—Gas	11	14	2	11	2	10
,, ,, Fuel	2	8	0	2	9	6
Repairs	113	1	1	5	3	6
Taxes—Insurance and Water	10	11	7	8	14	3
Museum and Art Gallery	1	13	0	5	13	7
Library—Books, &c.	33	13	1	40	4	7
,, Binding	8	12	9	7	4	9
Reports	39	19	6	60	5	0
Stationery, Printing, &c.	10	11	6	13	11	9
Conversazioni	8	7	3	11	5	10
Salary and Commission	25	10	9	25	7	9
Petty Disbursements	16	8	10	11	7	8
Postages	4	18	5	5	7	3
Excursions	0	17	0	1	5	10
Interest	21	2	11	26	2	11
Incorporation Expenses	...			17	18	6
Cheque Book	...			0	4	0
	£714	11	7	774	7	9
Balance	382	15	7	405	1	9

SAMUEL CATER, *Treasurer*.

JOHN G. NORMAN, } *Auditors*.
G. G. REW, }

SECRETARIES' REPORT.

1886–87.

The Secretaries have pleasure in presenting the following Report of the work of the Society during the Session 1886–87.

In some of the departments of the Society's operations there has been exceptional activity, and marked progress has been made in several directions.

The Lectures have been widely varied in their subjects, and an unusual number of new Lecturers has come forward. The attendance has been good, and above the average of last year, with a few exceptions arising from an unusual number of clashing engagements; and, as a rule, the discussions have been well maintained.

The following is the programme of Lectures, which, with one exception, and that owing to serious illness, has been adhered to:

1886.		Series I.	
Oct.	7.	Conversazione.	
„	14.	President's Address.	
„	21.	Notes on Deductive Economics and Individualism . . .	Mr. D. D. Dobell.
„	28.	Phœnician Inscriptions . .	Rev. G. Evans, M.A.
Nov.	4.	Water	Dr. R. Oxland, F.C.S.
„	11.	The Early History of Stonehouse .	Mr. R. N. Worth, F.G.S.
„	18.	Some Popular Song Writers of Ireland	Rev. J. Erskine Risk, M.A.
„	25.	Trawling	Mr. B. J. Ridge.
Dec.	2.	Leibnitz	Prof. C. C. Chapman, M.A.
„	9.	A Brief Sketch of the Origin and Development of the Railway System in England . .	Mr. E. Nicolls.
„	16.	Recent Proposed Modifications in the Darwinian Theory . .	Mr. Walter Heape, M.A.
„	23.	British Oak-Galls . . .	Mr. Bignell, F.E.S.

1887.		Series II.	
Jan.	6.	Conversazione.	
,,	13.	Our Wasps	Mr. Bignell, F.E.S.
,,	20.	Production and Transmission of Electrical Energy . . .	Mr. Jos. M. Coon.
,,	27.	The Marches Toward Scotland; or, Chapters from the History of a Northern Family . . .	Mr. A. J. Jewers, F.S.A.
Feb.	3.	Time	Dr. Merrifield, F.R.A.S.
,,	10.	Capital	Mr. Gilbert Slater, B.A.
,,	17.	Churchwardens' Accounts of St. Budeaux	Mr. Whitmarsh.
,,	24.	The Coal Tar Industry . .	Mr. T. H. Harvey.
Mar.	3.	Recent Dredging in Cattewater .	Mr. R. Burnard.
,,	10.	The Voyages of Sir Francis Drake	Mr. W. H. K. Wright, F.R.H.S.
,,	17.	Notes on Revenue Raising . .	Mr. R. H. McCarthy.
,,	24.	The Growth of our Colonial Empire	Mr. Frank Phillips, F.R.C.I.

The Society has now a larger number of Lecturing Members than at any previous time. The total numbers are: Lecturing Members, 92; Honorary Members, 13; Corresponding Members, 3; Associates, 126.

The Secretaries beg to suggest the desirability of the members and associates endeavouring to add to the roll of members, as being the most effective way in which the usefulness and efficiency of the Plymouth Institution can be increased.

Very important additions have been made during the year to the Library, the Museum, and the Art Gallery, by gift and bequest, particulars of which will be found in the Reports of the various Curators.

It has been found necessary to expend a considerable sum on the renovation of the original building. The roof of the lecture-hall, the ceiling of which had for some time been temporarily stayed, was found on examination to be in a really dangerous condition. It has been thoroughly repaired, under the direction of the Curator of the building—the ceiling match-boarded, and a sunlight put in (which has materially improved the ventilation,)—and the walls of the hall and staircase painted.

Cases for the Davidson collection of pamphlets have also been fixed in the lower Library, and by the liberality of a few friends much-needed additional cases added to the fittings in the Museum.

The extra expenditure of the year has thus been considerable, and the total debt now stands at £382, as against £405 at the corresponding period last year. It is hoped, however, that for several years to come the expenditure will resume a normal character, and the Institution be gradually relieved of the incubus which now somewhat limits its operations.

It is satisfactory to note that the valuable property of the Institution is at this date in a sounder state of repair and efficiency than it has been for some time past.

By way of experiment a course of lectures was kindly given at Christmas to the younger members of the families of the members and associates, which proved thoroughly successful. The Lectures were by: Dr. R. Oxland, F.C.S., on "Fire;" Mr. Tweedy, B.A., on "Light;" Mr. Bignell, F.E.S., on "Butterflies;" Dr. Merrifield, F.R.A.S., on "The Making of Worlds."

The Anniversary Meeting was held on May 1st, when papers were read by Mr. R. N. Worth, F.G.S., on "Marine Observations at Batten and Cattewater;" and by Mr. D. Slater, M.A., on "Rousseau."

There were two Conversazioni—the opening one on October 7th, when the pictures of the Plymouth Art Club exhibition were the leading attraction. A choice programme of music was rendered, under the direction of Mr. Löhr, who kindly undertook this duty for the Society. At the second conversazione, held on January 6th, a large numbers of photographs were exhibited by Mr. Tweedy, Dr. Oxland, Mr. F. Phillips, Mr. Hingston, Mr. G. Evans, and others. The musical arrangements were under the superintendence of the President, and songs were charmingly sung by Mrs. W. Adams, Miss Tweedy, Mr. Skelton, and others.

The Annual Excursion took place on July 1st, and formed one of the most enjoyable in the annals of the Society. The weather was all that could be wished, and the district visited exceptionally interesting and attractive. The party left Plymouth by the 9.5. a.m train for Ashburton, and started from the station in breaks and waggonettes.

The route taken was, by the kind permission of the Hon. R. Dawson, through the lovely glades of Holne Chase, by Newbridge, the new drive at Spitchwick, to which access was courteously given by Dr. Blackall, and so through the most picturesque scenery of the Dart, to the pleasant vale of Widdecombe. Here a halt was called, and the noble church—"the cathedral of the moor"—visited, the party being welcomed by the vicar, the Rev. J. Williams. Thence the party found their way to

Blackslade, the moorland residence of Mr. R. Dymond, F.S.A. Here they were hospitably entertained by Mr. and Mrs. Dymond, who afterwards accompanied them to the singularly interesting remains of an ancient tomb at Torr Hill. At Newhouse the party divided, some going direct to Ashburton, and others making a *detour* by picturesque Hey Tor. All met safely, however, at the Golden Lion, Ashburton, to enjoy high tea. Messrs. P. F. and J. S. Amery, of Druid, Ashburton, kindly acted as *ciceroni,* and to them the success of the day's outing was largely due. At Torr Hill a fine flint implement was found by Mr. Jasper, and presented by him to the Museum, where it now remains, a valuable memento of a most pleasant day.

Professor Ray Lankester, F.R.S., and the Rev. Dr. Dallinger, F.R.S., have been elected Honorary Members, and the Rev. W. Iago Corresponding Member.

There were four short excursions during the summer—an antiquarian one, under the direction of Mr. J. Brooking Rowe, to Buckland Abbey, where the party was most heartily welcomed by Mr. Bundock; a geological one, conducted by Mr. R. N. Worth, from Yelverton, over Wigford Down, by Cadover Bridge, to Shaugh and Bickleigh; a botanical one, conducted by Mr. D. D. Dobell, to Cornwood, where the members were kindly received at Slade by Mrs. Pode, in the unavoidable absence of Mr. J. D. Pode; and lastly, a yachting cruise, under the guidance of Mr. Watson, in the *Lola,* the well-known Plymouth yachting trawler.

The Curator of the Library reports:

"Your Curator begs to report that the books, &c., under his charge are in good condition. During the past year no binding has been done, except in the case of periodicals and continuous publications; but there are many books which require binding, and it is hoped that the finances of the Institution will be soon in such a condition as to allow this necessary expenditure to be made.

"The Council will be obliged to take into consideration very shortly the question of enlarging the Library. The shelves are now very crowded; and although temporary relief has been given by the provision of shelves in the lower room, the time is not far distant when it will be absolutely necessary to make further provision for the almost daily increase of books. The published

Reports of the Society seem to be much sought after, and there are constant applications for exchange, and this brings in many volumes yearly.

"Your Curator is desirous of expressing a very strong opinion that proper arrangements should be made for the issue of books. At present there is no check, the Society simply trusting to the person taking out a book entering it himself, and unless he does so there is no information as to its whereabouts. This plan answered when none but Lecturing Members were permitted to use the Library; but now that Associates have this privilege, the number of readers is greatly increased, and it is impossible to exercise proper supervision. At present volumes are missing, of which neither the Curator or Housekeeper have been able to find any trace. It is very desirable that so valuable a Library should be made available for as large a number of persons as possible, and your Curator hopes that something may be done to effect this, and at the same time to prevent loss or damage to what is, after all, the property of a private Society.

The most important matter to record in connection with your Curator's department is the presentation to the Institution of the large collection of Devonshire Pamphlets and Tracts—made by the late James Davidson and James Bridge Davidson—by the Rev. Thomas Davidson, Miss Davidson, Miss Mary Davidson, and Mrs. Julia Edwards, the children of the former and brother and sisters of the latter. It was intended that this collection should have been sold by auction; but the representations of your Curator, as to the great misfortune it would be to scatter what had taken so long getting together, induced the relatives to reconsider their determination, and they offered the books to the Council upon certain conditions, which were accepted. The conditions are simply that, in the event of the Society being dissolved at any time, the collection shall be returned intact to the family, and that it shall be maintained under certain regulations; and the following rules have been agreed upon between the family and the Council for the proper care of the tracts; viz.:

1. That the Tracts, &c., be kept together and in locked cases, and be called the "Davidson Collection;" and that a special label be provided for each separate Tract.
2. That the Tracts be not allowed to circulate or to be taken out of the building of the Athenæum.

3. That the collection be under the charge of the Curator of the Library, and only to be consulted on application to and at such times as may be arranged with him.
4. That any person wishing to see any Tract be requested to fill up a ticket in the form provided, and the applicant shall be responsible to the Society for the safe custody and return of the book.

At present no arrangements can be made for giving access to this collection. The Tracts are now placed as they were delivered, but it will be necessary to classify and catalogue them. This work is in progress, and it is hoped the Council will be able to print the catalogue when the MS. is ready. The gift is a munificent one, and the Society is to be congratulated that the Rev. Thomas Davidson and his sisters selected it to be the custodian of so interesting a collection. As far as can be ascertained, there are about 1500 separate tracts.

"The following works have been presented to the Library during the past year: 'Journal of the Royal Microscopical Society,' series 2, vol. vi. parts 1 to 6, vol. vii. part 1, by the Society. 'Proceedings of the Zoological Society of London,' 1885, part 4, 1886, parts 1, 2, 3, by the Society. 'Journal of the Geological Society of London,' vol. 42, parts 23 and 24, and vol. 43, by the Society. 'Proceedings of the Geologists Association,' 5, 6, and 7, vol. ix., by the Association. 'Proceedings of the Royal Society,' Nos. 242 to 252, by the Society. 'Proceedings of the Royal Geographical Society,' vol. viii. Nos. 4 to 11, by Mr. W. Square, F.R.C.S. 'Transactions of the Royal Geological Society of Cornwall, 1886,' by the Society. 'The Registers of Bishop Edmund Stafford,' by Rev. Preb. Hingeston-Randolph, by C. A. Hingston, Esq., M.D. 'The Proceedings of the Geological and Natural History Survey of Canada,' by the Society. 'Proceedings and Transactions of the Natural History Society of Glasgow,' and index to vols. i. to v., by the Society. 'Proceedings of the Belfast Naturalists' Field Club,' 1884–85, by the Society. 'Atti della Societa Toscana,' vol. vii., 1886, by the Society. 'Scientific Transactions Royal Dublin Society,' 1885–86, by the Society. 'Fifty-third Annual Report Royal Cornwall Polytechnic Society,' by the Society. 'The History of England,' in blank verse, by T. S. Burt, F.R.S.; 'Virgil,' translated into blank verse, 3 vols., by T. S. Burt, F.R.S.; 'Thomas à Kempis, the Christian's Pattern,' in blank verse, by T. S. Burt, F.R.S.; 'Sacred History,' in blank verse, by T. S. Burt, F.R.S.; 'Come to

Jesus,' by Newman Hall, in blank verse, by T. S. Burt, F.R.S.; presented by the Author. 'Observations on the International Polar Expeditions,' 1882–3, Fort Ray, by the Royal Society. 'Proceedings of the Somersetshire Archæological and Natural History Society,' 1885, by the Society. 'Report and Transactions of the Penzance Natural History and Antiquarian Society,' 1885–86, by the Society. 'Report of the British Association,' 1885, by the Association. 'Canadian Economics,' 1884, presented by the Montreal Committee of the British Association. 'Proceedings of the Royal Society, New South Wales,' 1886, by the Society. 'What I believe, by Leon Tolstoi,' by the Author. 'Proceedings of the Bristol Natural History Society,' vol. v. part 1, 1885–86, by the Society. 'The Flora of the Upper Tamar,' by Rev. W. Moyle Rogers, by the Author. 'A Contribution to the Flora of the Teign Basin,' by the Rev. W. Moyle Rogers, by the Author. 'Journal Royal Geological Society of Ireland,' 1884–85, by the Society. Report and Transactions Devonshire Association,' 1886, by the Association. 'The Devonshire Domesday,' part 3, by the Association. 'Journal Royal Institution of Cornwall,' 1886, by the Society. 'Proceedings of the Geological Society of St. Petersburg,' by the Society. 'First, Second, and Third Reports of the Fishery Board for Scotland,' 3 volumes. 'Della Physiologie Du Systeme Nerveux Georget,' 2 vols. 1821. 'Philosophie Geologique Lamarck,' 2 vols. 1809. 'Le Regne Animal, Cuvier, 4 vols. October, 1817. 'The English Flora,' Sir J. E. Smith, 3 vols. 1824. 'Introduction to Philosophical and Systematic Botany,' Sir J. E. Smith, October, 1825. 'The Publications of the Early English Text Society,' vols. i. to iv., extra series towards completing the set, presented by the Honorary Librarian. 'A Treatise on Nautical Astronomy,' by Dr. Merrifield. 'Catalogue of Minerals in the Australian Museum;' 'Catalogue of the Echinodermata in the Australian Museum,' part 1; 'Report of Trustees for 1885;' by the Trustees. 'Ninth Annual Report of the Plymouth Free Public Library,' by the Librarian. 'Notes on the Public Libraries of Plymouth, Stonehouse, and Devonport,' by J. Shelly, by the Author. 'The United States Geological Survey, Mineral Resources;' 'Bulletins of the United States Geological Survey,' Nos. 15 to 33;' 'First and Fifth Annual Reports United States Geological Survey;' and 'A Monograph of the Brachiopoda and Lamellibranchiata of the Saritan Clays,' &c., part 9;—by the Director of the

United States Geological Survey. 'Annual Report Smithsonian Institution,' 1884, by the Institution. 'Annual Report Guardian of Mines, New South Wales,' 1885, by the Department. 'Journal and Transactions of the Linnean Society,' by J. J. MacAndrew, Esq. 'Proceedings Berwickshire Naturalists' Club, 1885, by the Society. 'Journal and Proceedings Royal Society, New South Wales,' 1885, by the Society. 'Report Geological and Natural History Survey of Canada,' vol. 1, and maps to accompany, 1885, by the Society. 'Journal British and American Archæological Society of Rome,' vol. i. parts 1 and 2. 'Transactions Natural History Society, Northumberland, &c., 1886, by the Society. 'Transactions of the Essex Field Club,' vol. iv. part 2. 'Essex Naturalist,' January and February, 1887, by the Society. 'Proceedings of the Literary and Philosophical Society of Liverpool,' vols. xxxix. and xl., by the Society. 'Journal of the Cincinnati Society,' vol. ix. No. 4, by the Society.

"The following books have been purchased: 'Reports *Challenger* Expedition,' Zoology, vols. xiv. xv. xvi. 'Quarterly Journal of Microscopical Science,' 3 vols. towards completion of set. 'Larvæ of British Butterflies and Moths' (Butler), vol. ii.; Royal Society. 'Folk Lore of British Birds,' by Rev. C. Swainson. 'Coleoptera of the British Islands,' by Rev. W. Fowler, parts 1 to 10. 'Zoological Record,' vol. xxii. 'Ibis,' vol. vi., part 22, and Supplemental Index to vol. iv., towards completion of set.

The following periodical publications have been continued: 'Nature,' 'The Entomologist,' 'The Philosophical Magazine,' 'The Geological Magazine,' 'The Zoologist,' 'Annals and Magazine of Natural History,' 'The Entomologist's Monthly Magazine,' 'The Journal of Botany,' 'The American Journal of Science,' 'The Western Antiquary,' 'The Folk Lore Journal,' 'The Ibis,' 'Mind,' 'Grevillæ,' 'Quarterly Journal of Microscopical Science,' 'Journal of Anatomy and Physiology.'"

The Curator of Mammalia and Osteology reports:

"During the past year your Curator has to report the addition to your osteological collection of the following specimens, presented by Mr. F. Brent. The cranial bones of the following local fish: Pollock (*Gadus pollachius*), Whiting (*Gadus merlangus*), Haddock (*Gadus æglefinus*), Megrim (*Arnoglossus laterna*), Plaice (*Pleuronectes platessa*), Red Gurnard (*Trigla cuculus*); the superior maxillary bones and mandible, with the dental armature, of a Pelagic Bream (*Dentex argyrozona*); also the same parts of a Gilt-head, probably *Chrysophrys Australis* (the teeth of the latter are rather robuster than in Owen's figure, which places a note of interrogation against the specific name); and two dried specimens of a spiny lizard, which I have failed to name."

The Curator of Ornithology reports:

"During the past year Mr. J. Brooking Rowe has kindly given a good specimen of the Great Northern Diver in intermediate plumage, very unusual; and a gentleman staying at Scilly has kindly sent eggs of the following species: viz., Cormorant, Shag, Lesser Black-backed Gull, Common Guillemot, Razorbill, Oyster-catcher, Manx Shearwater, Puffin, Arctic Tern, all of which, excepting the Guillemot, are new to the Society's collection. Mr. B. Ridge has given a Puffin, the brightness of which shows how much our older specimens have lost by fading; and he kindly sent a Gannet, choked in attempting to swallow a large fish; both bird and fish were unfortunately too much spoiled for preservation.

"I have prepared and beg to enclose, a catalogue of all the birds and eggs in my charge, and I believe it to be correct. It exhibits the fact that there are many duplicates available for sale or exchange, and I hope during the ensuing year to submit a list of those which are so disposable, for the approval of the Council as opportunities may arise. The list has been totalled to facilitate re-survey. I beg to draw attention to the fact that the specimens which most require replacing mainly represent the commoner species, and that more than one easily-obtainable bird does not appear in the list at all."

The Curator of Conchology, in his report, begs to acknowledge the kindness of Mr. MacAndrew in examining and naming the shells in his care.

The Curator of Botany reports:

"I am glad to state that I have at length got the Herbarium in good working order, according to the London Catalogue, so that what is present and what is absent is at once apparent, and find there are 559 species represented, including a few additions I have made during the year.

"Nothing therefore practically remains to be done but field-work to supply vacancies.

"On the afternoon of August 14th a botanical excursion was made to Cornwood. By the kind offers of Mr. J. Duke Pode, J.P., Admiral Parker, J.P., and Lord Blachford, the fine old entrance hall and grounds at Slade, the grounds at Delamore, and the woods and waterfalls at Awns and Dendles, were respectively visited, Mr. and Miss Maxwell very kindly guiding the party. The following were the more noteworthy plants observed: *Epipactis latifolia* (Broad-leaved Hellebore); *Veronica scutellata* (Marsh Speedwell); *Scutellaria minor* (Lesser Skull-cap); *Tamus communis* (Black Bryony); *Pinguicula lusitanica* (Pale Butterwort); *Radiola millegrana* (Flax Seed); *Hymenophyllum tunbridgense* (Tunbridge Filmy Fern); *Myrica gale* (Bog Myrtle)."

The Curator of Geology reports:

"During the past year, through the influence of Mr. J. Brooking Rowe, the private collection of the late Mr. James Davidson, of Axminster, has been added to the Museum. This constitutes an important and valuable contribution, illustrative of the geology of East Devon and the western part of Dorset. The collection consists of upwards of 900 specimens, and contains examples of the Blackdown series of the Lower Cretaceous, also the Jurassic—Oolite and Lias—of Dorset, together with some from the upper Eocene beds of the Isle of Wight. Included in the collection are some mineralogical specimens. For the present, however, they have been placed together in a table case on the ground floor.

"During the past winter an important osseous deposit has been opened at Cattedown, in the course of excavations in the limestone, by Messrs. Burnard, Lack, and Alger. As the excavations are still in progress, no detailed account can yet be furnished. The whole of the deposit, however, has been generously placed at the disposal of the Institution by the proprietors, and the finds are being periodically forwarded to Mr. Worth for examination, who will report upon the whole on some subsequent occasion. A portion of the collection has been temporarily placed in one of the new cases. Included in the collection up to the present time are the remains of about fourteen mammals, among which are bos primigenius, bison priscus, bos longifrons, hyæna, roe deer, red deer, wolf, fox, goat, &c. But that which imparts special value to this deposit is the occurrence in it of the remains of man. Only on one occasion have the remains of man been previously found in our local cave deposits—viz., at Oreston—but upon that grave doubts have been cast by the attempt to conceal public knowledge. Concerning the present no doubt can possibly exist.

"Much needed additional show-table space has been provided during the past year by filling in the central spaces between the former cases. This will not only provide for the natural increase in the accumulation of specimens, but allow of the present collections being displayed to greater advantage; indeed, two of the new cases have already been utilized."

The Curator of Petrology reports:

"That during the year the collection under his charge has been largely extended and re-arranged, and is now, with the exception of some re-labelling, in proper order. New shelves have been added for the better accommodation of the specimens, which approach 2500 in number, and include many valuable typical examples procured at no cost to the Society, while important presentations have been made by the United States Geological Survey, Dr. Hicks, F.R.S., Admiral Bedford, Mr. Moses Bawden, Messrs. Blackler, St. Marychurch, Mr. Druitt, Poltesco, and others. Your Curator has also continued his efforts for the full illustration of all local varieties. The collection is contained in eleven wall cases arranged as follows: I. About a hundred typical examples of various rocks, including most of the rarer varieties of importance, with a series of rock-forming minerals, also a set of specimens of local Raised Beaches. II. Various local groups: Rocks of the shores of the Sound, of Drake's Island, of the Channel, and of Devon Great Consols and Tincroft Mines. III. Limestones, Sandstones, and Conglomerates, including a full series from the Lizard Triassic outlier. IV. Slates, Altered, and Archæan Rocks. V. Granites and Elvans. VI. Lavas, Ashes, and Tuffs, Devonian and Triassic. VII. Dolerites, Diabases, Serpentines, Gabbros, and Hornblendic Rocks. VIII. British Rocks, including collections of Welsh Archæan, and from the Channel Islands, Giant's Causeway, Scotland, and Charnwood

Forest, with a number of miscellaneous examples. IX. Polished specimens from Russia, France, Italy, the Pyrenees; a collection of Alpine Rocks; and some miscellaneous. X. Collections of Grecian Rocks, Phosphatic Rocks from Cerra Culebra, and of Fossil Woods, Agates, Jaspers, and Calcedonies. XI. Collections of Rocks, largely Volcanic, from Ascension, Antigua, Bermuda, Brazil, Canada, Curaçoa, Cuba, Cape Horn, Cape of Good Hope, Darien, Deception Island, Fernando da Norhonha, King William's Island, United States, Maranham and Para, St. Helena, Staten Island, Trinidad. Case I. is thus devoted specially to typical examples; Cases II. to VII. to rocks of Devon and Cornwall; Case VIII. to British rocks; Cases IX. and X. generally to European; Case XI. to American, African, and Oceanic."

The Curator of Anthropology records

"Several valuable presentations to his department of the Museum, from the family of the late Mr. J. B. Davidson, Messrs. Burnard, Lack, and Alger, and other sources. To the latter gentlemen the Society is indebted for the valuable presentation of a seventeenth-century cannon, dredged up in Cattewater in association with the remains of an ancient ship. There is no reason to doubt that this gun is a relic of the siege. It is mounted on a carriage, made, under the direction of Mr. Robert Burnard, of the timbers of the vessel; and accompanying it are the remains of the charge, still in the piece when it was dredged, and drawn by Mr. Burnard.

The Curator of Mineralogy reports:

"During the past year a few additions of minerals to the collection have been made, but nothing of importance. We have at present a very fine nucleus for a good collection. Most of the principal minerals are fairly represented, but the Curator will be glad to have further contributions, so as to be able to fill up vacancies, and replace present representatives by better and more perfect specimens."

The Curator of Fine Arts reports:

"The pictures in the Art Gallery remain in the same condition as when last reported. The removal of the portraits to the Art Gallery, where less gas is used, has arrested decay, but they all sadly want cleaning, and their frames regilding; and if we cannot find funds to renovate the whole at once, it will be better to have two or more done at a time; but there should be as little delay as possible. As to the removal of casts now in the Library, which has been suggested by the Council, to make space for books, some might be placed on brackets in the stairs, others on pedestals in the Art Gallery, *temporarily*, until better situations can be found for them.

"Two pictures by a late local artist, Mr. Francis Lane, for some years a member of this Institution, have been purchased, by subscriptions raised amongst friends, and presented to our Art Gallery. I have every reason to believe that this example will be followed by similar contributions.

"The exhibition of Oil and Water-colour Pictures held last autumn, comprising the works of the Plymouth Art Club, and their invited friends, was much better than usual, and formed the chief attraction of the conversazione at the opening of the session. The number of pictures sold was greater than at any former exhibition, not only paying expenses, but handing over a portion of the surplus as a donation to the Institution. The exhibition of the Plymouth Art Club must be now looked upon as annual.

"Great efforts will be made this year to exhibit more important pictures. Many suggestions have recently been made for increasing the contributions to the Art Gallery. Among them is one that must commend itself to all; that is, that the donations hitherto given by the Plymouth Art Club to our Institution should in future be devoted to a fund for the purchase of pictures by our deceased local artists."

JAMES C. INGLIS, } *Hon. Secs.*
H. PENROSE PRANCE, }

METEOROLOGICAL REPORT.

Sunshine in Plymouth for 1886.

Month.	Sun above the horizon hrs.	min.	Sun shone in Plymouth hrs.	min.	Percentage actual was of possible.	No. of days no sunshine.
January	259	59	56	10	21·6	11
February	277	1	50	25	18·2	11
March	363	45	85	13	23·4	10
April	409	0	154	45	37·8	3
May	473	26	184	5	38·9	3
June	483	28	210	45	43·5	1
July	487	4	218	15	44·8	2
August	442	19	154	45	38·0	4
September	373	19	117	20	31·4	8
October	326	47	80	35	24·7	7
November	264	32	64	25	24·4	9
December	244	19	77	25	31·7	6

The sunshine for the year was 33 per cent. of that possible, or he shone in Plymouth one-third of the time he was above the horizon; whilst on 75 days he was not visible here. The temperature for the year has been colder than the mean, caused entirely by colder days, nine months having been below and three months above the average. The freezing point was reached in the screen on 55 nights. Rain fell on 204 days to the amount of 35·3 inches, which is about 2 per cent. less than the average rainfall, but the number of rainy days was more than 9 per cent. greater than the mean. The greatest rainfall was on the 26th December, when we had 1·87 inches, 1·80 of which fell in six hours—the heaviest fall registered in Plymouth for so many hours, and what rendered it phenomenal was that a N.E. gale was blowing most of the time. This was the only day for the year that an inch was measured in 24 hours. The greatest atmospheric pressure for the year was on the 24th November, when it was 30·686; the lowest was on the 8th December, when it was 28·520, the range for the year being 2·166 inches. The highest temperature was 83·4 deg. F. on 4th July; the lowest was 22·2 deg. F. on 21st December, the yearly range of temperature being 61·2 deg. F.

Cold Months.—January, February, March, April, May, June, July, August, December.

Hot Months.—September, October, November.

Wet Months.—January, March, July, October, December.

Dry Months.—February, April, May, June, August, September, November.

The year has been rather dry. The number of mornings on which easterly or westerly winds have blown has been below the average, but the number of calm mornings has been far above the mean. The longest dry period was from the 16th August to 31st August, during which time only ·01 inch fell. The longest wet period was from 27th November to 28th December, during which time there were but two mornings on which no rain fell. From the 24th September to the 28th December there were only nineteen days on which no rain was measured, although we had drizzle on several of these so-called dry days. Great damage was done by gales in January, October, November, and December; snow fell on twelve days, and on 31st March a hailstorm, with extremely large hailstones, visited us. Thunderstorms were registered in March, April, July, and December.

An ABSTRACT from the METEOROLOGICAL REGISTER, from 1st January, 1886, to 31st December, 1886, kept at the Navigation School, Gascoigne Place, Plymouth (Lat. 50° 22½′ N., Long. 4° 7¼′ W.), by JOHN MERRIFIELD, LL.D., F.R.A.S., F.R.M.S.

MONTH.	BAROMETRICAL PRESSURE REDUCED TO MEAN SEA LEVEL AT 32° FAH.			TEMPERATURE.			HYGROMETER.				RAINFALL.		DIRECTION OF WIND AT 8 A.M.				
	Average Barometer	Maximum for Month.	Minimum for Month.	Average Maximum in shade.	Average Minimum.	Average temperature.	Average dry Bulb.	Average wet Bulb.	Average dew Point.	Average humidity, Saturation, 100.	No. of days on which not less than ·01 in. fell	Quantity for the month in Inches.	From N. by E. to E.	From E. by S. to S.	From S. by W. to W.	From W. by N. to N.	Calm.
1885																	
January .	29·701	30·255	29 053	44·37	32·64	38·50	37·44	36·61	35·45	93	27	4·56	4	2	7	8	10
February .	30·102	30·670	29·382	43·06	32·63	37·89	36·11	35·05	33·48	91	12	1·29	14	2	2	3	7
March . .	29·925	30·347	29·131	46·40	36·51	41·45	40·05	38·75	37·06	90	18	3·18	9	8	6	3	5
April . .	29·905	30·354	29·288	54·99	42·70	48·84	46·89	44·55	41·98	83	16	2·16	11	3	9	5	2
May . .	29·914	30·438	29·186	60·00	46·76	53·38	52·94	50·01	47·08	80	13	1·82	9	5	8	3	6
June . .	30·016	30·234	29·739	66·06	51·37	58·72	58·72	55·46	52·53	80	11	·74	3	3	4	10	10
July . .	29·952	30·347	29·493	69·32	55·42	62·37	62·61	59·59	57·07	82	13	3·47	2	2	14	7	6
August . .	30·012	30·256	29·499	67·31	54·69	61·00	61·11	59·05	57·32	88	9	2·20	2	1	9	7	12
September.	30·007	30·339	29·576	63·94	53·07	58·50	57·31	55·48	53·83	88	17	2·07	10	1	9	—	10
October .	29·753	30·183	28·710	58·88	48·67	53·77	52·90	52·29	51·68	96	24	5·17	9	5	7	4	6
November.	29·930	30·686	29 162	52·22	41·82	47·02	45·95	44·96	43·87	93	21	3·09	2	1	9	2	16
December .	29·745	30·537	28·684	46·66	33·79	40·22	38·86	38·09	37·01	93	26	5·65	3	1	11	4	12
Average for 1885	29·914	30·387	29·244	56·10	44·17	50.14	49·24	47·49	45·65	88	205	35·40	78	34	95	56	102
Average for 21 Years . .	29·992	30·398	29·314	57·76	44·93	51·34	50·50	48·61	46·63	87	186·6	36·12	78·0	61·2	103·7	82·5	39·8

The observations are all made at eight a.m. The Rain Gauge is by Casella, and 8 inches in diameter; its top is 9 feet 2 inches above the ground, and 75 feet above the mean level of the sea. A rainy day is one in which not less than 1-100th of an inch falls. The instruments have all been supplied by the Meteorological Committee of the Royal Society, compared at Kew, and the index error supplied to each.

ABSTRACT OF ADDRESS

AT THE OPENING OF THE SESSION 1886-7.

BY SAMUEL CATER,

President.

LADIES AND GENTLEMEN,—

Amongst many geological changes of the past few millions of years, none have been of more importance to us locally, than those which have caused the Gulf Stream to make our Port of Plymouth, when other waters in the same latitude are frozen and inaccessible to ocean traffic, open at all seasons. Besides this great advantage, those changes have also made Plymouth, from its position on the edge of the great north temperate ocean, and at the entrance of a channel up which the greatest part of the world's traffic goes to and from the most commercially active nations of the globe, both in Europe and America and to the East and West, the best port for the arrival and departure of ships from and to all parts of the world.

Nature having thus done so much for us, it is my intention to bring before you what Engineering Art and Science have done in aid. And, first, as to Engineering works in England and Scotland, rendering access easy from all parts of this island to this port.

It has only been possible within the last few years, by modifications in the manufacture of iron, for our engineers to construct such a gigantic bridge as that now being made over the Firth of Forth, near Edinburgh, to shorten the route from the large emporiums of Dundee and Aberdeen, and also the north-east of Scotland, to England. This bridge has clear spans of one-third of a mile in length, at 100 feet above high-water. Its only competitor in the world is the bridge from New York to Brooklyn, which has spans of about the same length; but in other respects is more remarkable, as it not only accommodates a railway, but also cart and carriage roads and footways.

Of Tunnels, we have two remarkable ones—the one under the Mersey, connecting Liverpool and Birkenhead; and that under the Severn, connecting the towns of Bristol and Cardiff and Swansea, and South Wales and the West and South of England.

The Mersey Tunnel is $2\frac{1}{6}$ miles long, of which three-quarters of a mile is under the bed of the river; and cost, with connecting railways, £1,000,000.

The Severn Tunnel is one of the greatest engineering feats executed in Great Britain. Begun sixteen years ago, it has just been completed under enormous difficulties. Without the engineering appliances invented within the last few years and during its construction, it would have been almost impossible to contend with the floodings by land-springs and tidal waters, let in through fissures in the rock. It runs $2\frac{1}{4}$ miles under the river Severn, is 50 feet below the deepest part of that river, and cost £2,000,000 in construction.

Another great engineering work affecting our locality is the Tilbury Docks, opposite Gravesend. They are of large extent, and allow of the largest ships entering at low-water, without having to wait for the tide, as at Liverpool and elsewhere, thus avoiding the difficult and dangerous navigation of the Thames, and enabling ships to fix times of departure irrespective of tide. If, as it is hoped, in addition to the Australian traffic by the Orient and other lines, which now start thence, it attracts the American lines, it will be most advantageous to us, as the steamers will call here, and thus save to passengers 300 miles of the Channel—of which Mr. Froude says, "In all the world there is no more uncomfortable stretch of water than the English Channel in nasty weather"—as well as the danger of such a crowded and narrow thoroughfare.

There are many great engineering works projected or in course of construction, such as the canal through the Isthmus of Corinth, to connect the Ægean with the Adriatic Sea; that from the mouth of the Elbe to Kiel, large and deep enough to enable German ships of war to pass from the Baltic to the North Sea, and avoid the long and dangerous passage round Denmark; the canal connecting Amsterdam with the North Sea, costing

£3,000,000; and also the projected Manchester Ship Canal, for a similar purpose, to cost £6,000,000, but with a population three times as great and a traffic of much more importance. Two canals, however, and one railway, have more immediate bearing on our subject; viz., the Suez Canal, the Panama Canal, and the Canadian-Pacific Railway.

The Suez Canal is well known. Its length is 103¾ miles, depth 25 feet, width 72 feet at bottom, to be increased to 75 yards at bottom and 90 yards at top, when it will take an indefinite amount of traffic, which hitherto has doubled every five years, The Company's capital is over £19,000,000; working expenses, £175,560; and it pays handsome dividends.

The Canadian-Pacific Railway, which gives this country independent access from London (*viâ* Plymouth) over its own territories to its Colonies and other countries with which it has large commercial interests, on the shores of the Pacific, is 2,895 miles long, from Montreal to Vancouver. Add to this the continuation from Montreal to Halifax, about 755 miles, and there is a railway, entirely through British territory, of about 3,650 miles. It goes over the Rocky Mountains, 5,000 feet above the sea, and passes through a very fertile region—perhaps the finest wheat-growing and grazing country in the world.

The Panama Canal, now in course of construction under the superintendence of M. de Lesseps, the engineer of the Suez Canal, is, according to him, to be completed in 1889, and is *estimated* to cost £25,200,000, although it is quite clear that this estimate will be much exceeded, and may possibly be more than doubled. It is to be worked at an expense of £384,000 annually. It is but 45⅝ miles in length, and very nearly follows the course of the present railway across the Isthmus of Panama—from Colon on the Atlantic to Panama on the Pacific. The highest elevation of the country through which it goes is only 278 feet. For the first 28 miles it will be excavated through soft ground, for the next 14½ miles through rock of various depths, and for the remaining distance again through soft ground. In the soft ground the width at the water level is to be 164 feet 6 inches; at bottom, 105 feet; depth, 26 feet 3 inches. In the rock and cutting—width, 91 feet 10 inches at water level; 78 feet 9 inches at bottom; depth, 29 feet 6 inches. In sea channel—width of bed, 328 feet; depth, 31 feet. There is to be a lock at the Panama end, and huge flood-gates are required to regulate the tides, and prevent too swift a current in the waterway. So there is no fear of the Gulf Stream being diverted ; and, further, the mean level of the tides on both sides the Isthmus is about the same.

In passing it may be as well to state that two rival schemes are projected. First a canal further west in the isthmus by way of the San Juan River and Lake Nicaragua. This route is 180 miles long; but in consequence of making use of the river and lake it will not cost a quarter as much as M. de Lesseps' canal. But it is still in *nubibus*, and would be a bad speculation in competition with the other shorter and therefore better means of communication.

The other rival scheme is a ship railway in Mexico, from the Gulf of Mexico to the Pacific, to cost £15,000,000. The ship is to be lifted by pontoons on to a trolly, on twelve lines of rail, and drawn by six steam-engines, each capable of drawing 2,000 tons, a distance of 134 miles by land, from sea to sea. Cradles are to be provided, of different sizes for different ships, to prevent straining.

Before treating of the effect the Suez Canal has had, and the Panama Canal will have, upon the trade and commerce of the world, including England, and of the effect the Canadian-Pacific Railway will have upon England and ourselves locally, and how other and older and present routes are and will be influenced thereby, it will be useful for a few minutes to describe the rapid strides that have been made in the means of crossing the ocean, by improvements in the speed and capacity of steamers.

In 1838 the *Great Western* steamship crossed the Atlantic, and in 1840 the *Britannia*, the first Cunard steamer; and the Company, with that and other ships, kept up the mail service at a speed of eight and a half knots an hour. These were paddle boats. In 1850 iron boats propelled by screws came into use, and gradually the size of the vessels increased until we have now a ship of 8500 tons instead of 1156 tons, and of 542 feet in length instead of 207 feet, with a speed of over twenty knots an hour instead of eight and a half. And engineers state that express steamers can be built, carrying only passengers and no cargo, with twin screws, to run forty miles an hour.

Having thus described the various engineering works, forming or to form different means of communication between various parts of the world, and the transport thereby, it will be interesting to compare the different routes, and point out the advantages of each, and the probable effect they will have upon the passenger and goods traffic passing to and from our country, China and Japan, and our colonies in Australia.

With regard to India, including the Straits Settlements, neither the new route by Panama, nor that by the Canadian-Pacific Railway, can compete with the old routes by the Cape or Suez; for taking Singapore as the limit, the distance to that place by way of Panama is 15,000 miles, and by the Canadian-Pacific Railway 13,400; or if the distance across the Dominion of Canada is halved, as the speed would be double that by steamship, 11,500—in comparison with 11,500 miles by the Cape, and by the Suez Canal 8000 *viâ* Gibraltar, or 6500 *viâ* Brindisi.

In the following statement of distances to various places in the East, fractions of fifties are not taken, and the distance by rail over the Canadian-Pacific Railway is, as above explained, halved, and made to count as 1825 miles instead of its real distance of 3650.

Hongkong.—The Panama route is 1800 miles further than by the Cape, 6800 miles further than by Brindisi, and 4600 further than by the Canadian-Pacific Railway.

Shanghai.—The Panama route is 700 miles further than by the Cape, 3650 miles further than by Brindisi, and 4900 miles further than by the Canadian-Pacific Railway.

Yokohama.—The Panama route is 1100 miles nearer than by the Cape, 3900 and 4800 miles further than by Brindisi and the Canadian-Pacific Railway.

Australia.—Sydney by Panama route is 100 miles more than by the Cape, 2450 miles more than by Brindisi, 450 miles more than by the Canadian-Pacific Railway, but 350 miles less than by Cape Horn.

The distance to and from Melbourne would give an additional advantage of 1000 miles to the Cape and Brindisi routes, thus making the former 1100 miles nearer (with the further advantage of no dues to pay) and the latter 3500 miles nearer. It would even be an advantage for cargo boats to come in the proper season by Cape Horn, as it is only 350 miles further, and would avoid canal dues. Passenger boats might take the Panama route instead of risking the deadly climate of the Red Sea in the northern summer.

New Zealand.—By Panama it is 400 miles more than by Brindisi, 900 miles more than by the Canadian-Pacific Railway, but 300 miles less than by the Horn, and 1950 miles less than by the Cape.

Here evidently the Cape route is out of the question; but for Cape Horn cargo boats have only 400 miles further to go to save dues, and can coal at the Falkland Islands or Rio. The Panama route is 400 miles further than that by Brindisi, and 900 miles than by Canadian-Pacific Railway. The latter route, however, cannot compete with the other routes for cargo boats, but only for passengers, and light and valuable traffic.

The most interesting of all the routes mentioned, to Englishmen, and one which might be of inestimable use to us in time of war, is that by the Canadian-Pacific Railway, the only route in British territory throughout which connects our Dockyard ports of Plymouth, &c., Halifax, and Vancouver, and our other ports in the Pacific and Indian Ocean, and comes in aid of the route by the Cape. It is also a much more pleasant journey for passengers from Australia and China and Japan in summer, over the comparatively temperate waters of the Northern Pacific and country of the Dominion of Canada, and over the North Atlantic, than to suffer the deadly heat of the Indian Ocean and Red Sea, or the Isthmus of Panama and the West Indies.

By the Canadian-Pacific route the distance from Plymouth to Yokohama is nearer than by Brindisi 900 miles, than the Cape 5900, than Panama 4800; to Shanghai it is nearer than by the Cape 4200 miles, than Panama 4900, but further than by Brindisi 750 miles; to Hong Kong it is nearer than by the Cape 2800 miles, than Panama 4600, but further than by Brindisi 2200.

The further west we come, of course, the matter becomes less advantageous for the Canadian-Pacific; but it will be seen from the above statement that it has the advantage over the Cape and Panama routes of some thousands of miles in each case, and to Yokohama it is 900 miles nearer than by Brindisi; but with respect to Shanghai and Hong Kong, it is at a disadvantage of 750 miles and 2200 miles respectively against Brindisi. It will not, however, as has been stated by some enthusiasts in the interests of the Canadian-Pacific Railway, shorten the time in getting to Yokohama by twenty days, and accomplish the distance to Hong

Kong and Australia in the same time as by the Brindisi route of the Peninsular and Oriental; for in the first case it only saves 900 miles, and in the latter cases is 2200 and 2500 miles respectively further.

With reference to Australia, by the Canadian-Pacific Railway the distance from Plymouth to Sydney is nearer than by Panama by 400 miles, than the Cape 350, than Cape Horn 800, and is further than by Brindisi 2000. Here the Brindisi route has an enormous advantage over all. To New Zealand it is nearer than by Panama 900 miles, than the Cape 2850, than Cape Horn 1200, than Brindisi 500, so that to New Zealand the Canadian-Pacific Railway has the advantage over all others.

Another phase in considering this subject is the provision and carrying of sufficient coals for the long voyages in order to obtain high speeds. There seems no difficulty up to 2500 miles, the distance traversed by our *fast* steamers across the Atlantic; but when we remember that we have 4630 miles from Panama to Oparo, the first stage on the voyage thence to New Zealand, and 4300 from Vancouver to Yokohama, a difficulty will arise how steamers can carry their burden of coals, and go at *high* speeds. The *Etruria*, with 14,321 indicated horse power, going 20·18 miles an hour, consumes 315 tons per day, which at 9·55 days would be over 3000 tons, an appreciable quantity of non-paying cargo, and retarding the ship's motion through the water. The same disadvantage applies, though in a less degree, to the other routes, as coaling stations average every thousand miles on the Suez line, except from Galle to King George's Sound, which is 3000 miles, and Plymouth (the Panama route) to Bermuda 2900, Vancouver to Sandwich Islands 2400, and thence to Fiji 2700. The remedy seems: either to use steamers like the *America*, 441·8 feet in length, and 5528 gross tonnage, which has a speed of 17·8 miles per hour, and only consumes 185 tons per day; or to reduce the speed of the steamers, which will give an immense advantage to the route by the Canadian-Pacific, as it is so much more than any of the other routes *by land*, where the speed can be increased instead of being reduced. Another remedy is the improvement of engines on the expansion principle, which may save the consumption of coal to such an extent as to enable steamers to go much longer voyages than at present, with less burden of coal to start with, avoiding the necessity of going out of their way, and the delay in stopping at coaling stations *en route* to replenish.

The foregoing comparisons and statements do not encourage the belief that the traffic to China, Australia, or even New Zealand, will be diverted from the other routes, and pass to any extent through the Panama Canal; and there are no large emporiums of commerce *en route* to help, as there are by the route of the Suez Canal and Canadian-Pacific. Steamers coming through the canal might get some traffic from connecting steamers at Panama with California and Chili and Peru, whose population does not exceed on the west side of the Andes and Rocky Mountains 16,000,000; for it must be remembered that railways take the traffic from the basins on the east of these mountains to the north and south Atlantic ports, such as Buenos Ayres, Rio, Rio Grande, Orleans, New York, &c. There are also the immense river systems in North and South America, east of the Andes, and the Rockies. Besides, in cases of cargo from California, Chili, and Peru, it would save freight, cost of transfer and time, for cargo boats to take commodities straight through the canal to their destination, and therefore only passengers and light goods would be transferred. The canal would, however, take a large amount of coasting traffic between the Eastern States of America and California, and such as it would not pay to send by railway.

It has been anticipated that as the Suez Canal has been such a success in attracting and increasing traffic, that the Panama Canal would do the same, but the positions are hardly parallel. There has from time immemorial always been a large intercourse and traffic between the ancient and modern populations of the basin of the Mediterranean and the West, and those of the countries of the East, which all went this way until the discovery of the Cape route in the latter part of the fifteenth century to a great extent diverted it. The making of the Suez Canal caused the traffic to return to its ancient and natural channel, and arrested the decay of such ancient cities as Genoa and Venice. The Panama Canal will not to any appreciable extent again divert it, for the eastern route is, as it always has been, the shortest between the nations of Europe immediately bordering or having direct access to the Mediterranean and the East; and serves, and will always serve, as the best means of communication between a population of 300,000,000 in Europe and 600,000,000 in India, China, and the neighbouring countries. Plymouth, indeed, is especially interested in the development of the new routes of traffic, for instead of the stream of passengers and light traffic going from England by the overland route, *viâ* Brindisi, or other ports of the Mediterranean, and avoiding the sea so far, they would make this the point of embarkation and debarkation for the Panama Canal or Canadian-Pacific Railway, and we should so far benefit.

Whatever differences of opinion, however, there may be as to the commercial success of the new means of communication between the eastern and western portions of the world, there can be none as to the benefits which will be effected by them in bringing together more easily and more rapidly the different peoples of the earth. Every such endeavour is to be welcomed and encouraged, as facilitating not only the cheap and rapid exchange of commodities, but also the transit of travellers, tending to make the nations of the earth more known and less foreign to each other. With more intimate knowledge we may hope to avoid causes of contention, or if not to avoid them altogether, to deal with them as between friends, and thus promote the inestimable blessings of goodwill and peace.

CONVERSAZIONE.

(7th October, 1886.)

For an account of this, see the Report of the Secretaries.

NOTES ON DEDUCTIVE ECONOMICS AND INDIVIDUALISM.

SYLLABUS OF LECTURE BY D. D. DOBELL.

(Read 21st October, 1887.)

The two logical methods pursued in regard to Political Economy. The inductive or historical method and its data. Its favour with modern Socialism. The abstract deductive method and its data. The deductive method more scientific. Admitted economic facts where the commercial spirit prevails. Generalization therefrom. Brief notice of the economic nature of capital, interest, profit, wages, cost of production, natural value, rent, price. Tendency of economic errors to produce offences against property, as well as to lessen the amount of wealth produced. Importance of Political Economy. Democracy the sovereign power. The leaders of unripe public opinion exercise the sovereignty. Sovereignty implies subjection. Instances of functions and limits of sovereignty. Some evils of over-government. Inestimable value of the English common law. Its growth. Its dependence on and security for freedom. Its support of individualism and the competition for wealth. Conclusion.

PHŒNICIAN INSCRIPTIONS.

SYLLABUS OF LECTURE BY REV. G. EVANS, M.A.

(Read 28th October, 1887.)

THE Geography of Phœnicia. Its chief towns. What reference there is to them on the cuneiform inscriptions. Meaning of the word "Phœnicia." What is its root? The language of Phœnicia. The writing of Phœnicia. Its trade and culture. Its religion. The highest god El-Elyon, called by various names—Baal, Moloch, Astarte. The three most important Phœnician inscriptions are—(1) The Marseilles Inscription; (2) that on the sarcophagus of Eshmunazar; (3) Moabite stone. Each of these translated and briefly commented upon.

WATER.

SYLLABUS OF PAPER BY ROBERT OXLAND, PH.D. F.C.S.

(Read 4th November, 1887.)

A CONSIDERATION of some of the chemical and mechanical properties of Water; of its economy in Nature, and its uses in the arts and manufactures.

NOTES ON
THE EARLY HISTORY OF STONEHOUSE.

BY R. N. WORTH, F.G.S.

(Read 11th November, 1886.)

A VERY important fragment of the early history of Stonehouse is embodied in its name. The first allusion to the place is found in *Domesday*, where it appears as Stanehvs. This is, of course, simply an older form of the modern title, which indicates the presence at the spot, before the Conquest, of what was then a somewhat notable thing—a dwelling of the kind the old writers were fond of calling "stane and lime." Hence, compared with the adjacent manors, Stonehouse, eight centuries since, possessed an important distinctive feature. Why so substantial a structure should have been erected there we may speculate, but cannot know; and it is only a suggestion which can have no definite authority, that the great natural strength of the duplex peninsula led to its selection for such a residence; while it must always have had a special importance from its nearness to the opposite shore, long ere that contiguity developed into the establishment of Cremill ferry.

And at this early date the site of what is now Stonehouse was far more peninsular than now. Stonehouse Pool, or Stonehouse Lake, extended along the western and northern boundary, as at present; but Millbay long afterwards stretched through an inner reach, under the name of Surpool, to the foot of the present Stoke Road, at the corner of the Royal Naval Hospital wall; and while its waters also extended westward, nearly on the line of Union Street, those of Stonehouse Pool expanded eastward on the same line. Thus the bold limestone hill to the south of Union Street was connected to the higher slate ridge of the North Road by a comparatively narrow isthmus, rising a very few feet above high-water mark. Indeed, the time can hardly have been very remote, and barely prehistoric, that the limestone peninsula formed two complete islands. When *Domesday* was compiled, it was, however, an irregular narrow promontory, broadening out, as now, in two headlands towards Mount Edgcumbe and the Sound; and narrowing at two points, one near the south end of Durnford Street, where it was barely 150 yards wide, and the other, already noted, on the course of Union Street, about 400—a double peninsula with two low-lying isthmuses, not at all a promising piece of property at the outset, but one which certainly had great defensive capabilities.

For the first distinct evidence of human occupation of Stonehouse, we are indebted to a note made by Mr. Henry Woollcombe, who has recorded the discovery in 1815, near the old turnpike gate between Stonehouse and Plymouth, which stood at the corner of Phœnix Street, of a kistvaen. It was of an early type, consisting of six slabs of stone forming a chamber 3 feet 6 inches long, 2 feet 2 inches wide, and 2 feet 3 inches deep; and it contained some fragments of bones, and a rude urn of baked clay holding a quantity of ashes. From the position indicated it is clear that this find must have been made towards the eastern end of what is now called Battery Hill.

The Stanehvs[1] of *Domesday* was a very small manor. Before the Conquest it had gelded only for one ferling, which was the sixteenth of a hide; and as the Danegelt was six shillings on each hide, the rateable value of Stonehouse was therefore but fourpence halfpenny. It had, however, at the Survey one plough land. We may hence fairly presume that it had been greatly improved since the first imposition of the geld, for the Saxon hide and the Norman carucate may be regarded as practically equivalent, each including as much arable as one plough team could till in the course of a year, usually reckoned at 120 acres. Moreover, it had only one recorded inhabitant, a villein, who rendered to the lord five shillings annually. This lord was one Robert the Bastard, who had succeeded to the Saxon Alwin, not only here but at Efford and in other properties in the neighbourhood.

The *Domesday* Stanehvs is also remarkable, not only for its smallness in extent and value, but for the fact that there is not set down for it any stock, or any meadow, pasture, or woodland, and that no part of it was held in demesne. It was practically farmed by its villein at a fixed rent. Small as it was, there were less valuable manors in the district—Pithill, for example, was only worth two shillings to its lord annually, and some other moorland and upland manors reached but three shillings. With the one local exception, however, of Wederidge (Withyhedge), Stonehouse has assigned to it the smallest stated area; and its exceptional relative value, therefore, is probably due to the conditions under which it was held. Though it passed from Saxon ownership at the Conquest, I have no doubt it remained in Saxon hands. As the present extent of the parish is 385 acres (including the lands added by reclamation since, and the addition of a portion of Sutton Valletort) allowing for waste, &c., its *Domesday* value must have been fully assessed.

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[1] The proper names throughout this paper are spelt as they occur in the documents cited, with all variations.

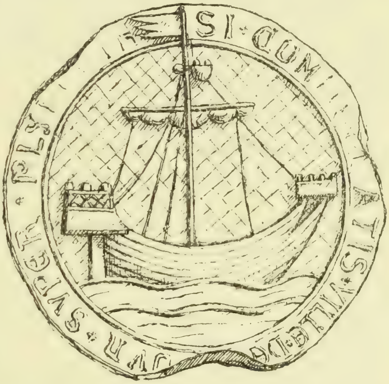
Passing from *Domesday*, and coming to times regarded as distinctly within the domain of recorded history, we notice two things: first, that our local topographers and historians have very little to say about Stonehouse at all; second, that what they do say is almost wholly incorrect. There is no need therefore to waste space in citation. One of the most prominent of the assertions which one writer has copied from another, and which appears to have originated with Sir William Pole, is that Stonehouse was anciently called Hepeston, and took its present name from the family who owned it. There is no existing trace known to me that Hepeston was ever the name of Stonehouse, or of any place in Stonehouse. The family had their name from the manor, which was called Stonehouse centuries before they were connected with it. Still, while Stonehouse has not an important it has an interesting history, and in dealing with that history we are traversing what is practically new ground.

In the endeavour to follow the record of Stonehouse on from *Domesday*, I have been much indebted to the kindness of the Earl of Mount Edgcumbe, who courteously gave me access to various sources of information among his family archives. These date back to the opening years of the thirteenth century; and the information contained therein I have been able to supplement from sundry other sources, among others from the ancient Churchwardens' Book, kindly placed at my disposal by the vicar, the Rev. P. Scott.

The Edgcumbe muniments make the manorial connection of the Bastards with Stonehouse perfectly clear to its close, very nearly three hundred years after the date of *Domesday.* In 1317 (11 Edward II.) we have a grant from Baldwin Bastard, knight, to Henry Bastard,[1] his son, of all his land in Stonehouse, near Sutton, within "great diche," with the rents and services of William Stockelegh, and the reversion of his lands after death. This great diche was the great dyke at Millbay which formed part of the Plymouth boundary, and the lands thus conveyed evidently adjoined Surpool.

Three years later, 1320 (14 Edward II.), Richard Bastard makes grant and quit claim to his brother Henry aforesaid, of land in Stonhouse, "within great diche."

Gonilda, the daughter of this Henry Bastard, married William Snapedone, and she was the last of the Bastard family who had any territorial connection with Stonehouse. In 1368 (42 Edward III.) she and her husband granted their property in Stonehouse to Stephen Durnford — as lands in Stonehouse near Sutton, within "great dych," and the fishing and mulctures at mills of Sourepol, Stenmistre, and Tolfri. This is a remarkably interesting deed for Plymouth folk, for there remains attached in excellent preservation the only impression extant of the seal of the ancient corporation of Sutton, the device being a ship on the waves, and the legend, "SI · COMMVNITATIS · VILLE · DE · SVTTVN · SVPER · PLYMOVTH."



But Gonilda still retained certain rights. After the death of Snapedone she married one Walter Jardyn, and was again a widow in 1406 (7 Henry IV.). In that year, as Gonilda of Eststonhous, widow, she granted to John Gorges, lord of Warleigh, in pure widowhood, her whole estate in the lordship of Eststonhous; and Gorges in turn granted to Stephen Durnford the elder, the estate in Eststonhous which he held of the grant of Gonilda, lady of the place, the Durnfords paying Gonilda £10 yearly for life. But even after this date there remained members of the Bastard family connected with Stonehouse, as tenants.

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[1] The *Inquisitions Post Mortem* mention a Henry Bastard in 1243 (27 Henry III.), *qui utlagatus est,* and he was probably a member of the family. I am not so sure of the connection of Peter le Bastard, who was dead in 1276 (4 Edward I.), leaving a wife Emma, and a son John, then about eleven years old. Still it is quite possible that Peter was also one of the race. Henry was an accustomed family name.

At the time of the transfer to Stephen Durnford, in 1368, the Bastards had, however, long ceased to be sole lords of Stonehouse. Reginald de Valletort was one of the most important Norman under-tenants in the district at the *Domesday* survey. His chief manor was at Trematon, whence he exercised rights over the waters of the Tamar; and among his estates was the Cornish Macreton, or Maker, which, with Trematon and many others, he held under the Count of Mortain. The Devonshire Maker, with Sutton, were subsequently given to the Valletorts by Henry I., and John de Vautort held them in 1281.

The succession of the Valletorts has never been clearly traced; and I cannot attempt the task now.[1] It will be enough for my present purpose to say that the family did not die out, as is often stated, in the thirteenth century with Roger de Valletort, deceased in 1289. Changes took place in their holdings, but the family continued to the reign of Henry VIII.; and we find them dealing with property at Sutton long after their extinction has been assumed. They retained also an interest in Maker; Richard Vautort is mentioned as lord of Maker, and as granting lands there in 1426 (4 Henry VI.); and John Vautort as dealing with lands in South Millbrook in 1433. As is well known, the Valletorts made certain grants of lands and rights in Sutton to the Priory of Plympton, and thus created what was afterwards called Sutton Prior, their own name remaining attached to their ownership of Sutton Vautort or Vautier. They had a residence at Sutton; for Ralph de Valletort in a grant mentions a way to Surpole by the corner of his garden of Sutton—*anglo gardini mei de Suthtona.* The site is very clearly indicated in a couple of Lord Mount Edgcumbe's deeds, dated 1370 (44 Edward III.) and 1373 (47 Edward III.). In the first of these James Vautort, lord of Sutton, releases in fee to Stephen Durnford, Vautordispark atte Pole, at the west part of Churcherhull, the way from Sutton to Stonhous lying north, the meadow of William Cole south, and the land of Thomas Cok called Romisbery west. It had been previously leased to Stephen by the render of a rose at Midsummer. By the second deed John Vyncent and John Holcomb grant this same land to Stephen and his wife Cecilia, the boundaries being the same, with the important addition that the highway to Sourepolemylle lay to the east.

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[1] The following notes, chiefly drawn from the *Inquisitions Post Mortem* may, however, be of interest and use. We have seen that the Valletort of *Domesday* was called Reginald. He had a son called Roger, who in his turn was father to a second Reginald. There was a second Roger living in 1195. We next get John de Valletort in the earliest dated of the Edgcumbe muniments—1226.

In 1246 (30 Henry III.) there occurs in the *Inquisitions* Ralph, heir of Reginald Valle Torta, being his brother, and these were sons of the second Roger. In 1255 (39 Henry III.) we have John de Valletort. In 1270 (54 Henry III.) there is Reginald de Vautort, alias Valetort, whose father, Ralph of 1246, died in 1259, whose mother was Johanna de Vautort, and whose heir was his uncle Roger. In 1283 (11 Edward I.) a Roger de Vautort is dead, but Roger the uncle, who gave Trematon to Richard Earl of Cornwall, is said to have died in 1289. In 1300 (27 Edward I.) there dies Hawisia, wife of Reginald de Valletort. In 1302 (29 Edward I.) the death is recorded of John de Valletort, son of John and Alice his wife. The father of Joan Valletort, the concubine of Richard, was Reginald or Roger de Valletort, son of John; and there was a Reginald who died *circa* 1315. Philip de Valletort is mentioned as a holder of property in Plymouth, in a deed *circa* 1150; lands of Robert the Bishop adjoining—the witnesses, Plymouth residents, being Roger de Fletehenda, Gilbert cycharista, William pistore, John Boscher, Reginald de veifer. There are some important references to the Valletorts in the Cornish *Biographical Notes* of Mr. G. C. Boase.

This enables us to fix the site with absolute precision. Churcherhull is Church hill—the hill on which stands St. Andrew Church. The highway to Stonehouse ran fairly along the line of what is now Bedford Street, Frankfort Street, King Street (a little north to avoid the edge of Surpool) to Fore Street, Stonehouse, where it turned sharply south to the ferry at Cremill—now Devil's Point—then, as long after, the chief thoroughfare from this part into Cornwall. Romisbery evidently indicates the existence of an old earthwork, probably near the end of the Western Hoe. William Cole's meadow must have lain on the northern slope of the Hoe, adjacent. The highway to Sourepolemylle—Millbay—is either that mentioned in various old deeds as running from Sutton Pool thither, or a branch thereto from the Old Town. The garden and park of the Valletorts thus lay between the two roads, on the south side of Bedford Street, from Westwell Street on; and the residence would be closely adjacent to the church.

The earliest dated deed among the Edgcumbe muniments does not directly link itself with Stonehouse. It is a grant in 1226 (10 Henry III.) from John de Valletort to Thomas Fitz Ralph, of the lordship of Crimel, with an acre of Cornish land in Hymbecombe (Empacombe), and a piece of land which Godfrey Pleia held of the said John in the lordship of Crimel, with other lands.

Three undated deeds, which are associated with Stonehouse, seem to connect themselves, however, with this. By the first, Roger de Valletorta grants Ralph son of Richard, his whole land of Crimela and Machra, to hold in fee and inheritance by the service of the ninth part of a knight's fee. By the second, Reginald de Valletorta grants to Ralph son of Ralph the whole land of Crimell and Machra, with the passage of Crimell, &c., which Roger, Reginald's father, had granted to Ralph, Ralph's father, with the free passage and fishery of the water of Tamere, to hold as above. By the third, the same Ralph grants to his brother Thomas the whole land of Crimell and Macre.

These Ralphs and Thomases, and their descendants, are the family whom we subsequently find with the territorial surname of Stonehouse. Their origin is distinguished, though barred. Richard, the father of the first-mentioned Ralph de Stonehouse was no less a personage than Richard, Earl of Cornwall, son of King John, King of the Romans as he is best known in history; and since there is no Ralph among his legitimate descendants, there is some reason to infer that this son was the son of Richard's mistress, Joan de Valletort, and that the grant made was not without consideration of kinship.[1]

We have Thomas, son of Ralph de Stonhous, mentioned in 1298 (26 Edward I.), probably the same (but they all seem to have been Ralphs and Thomases in turn), and we find him, in 1299, demising to Roger de Haston a moiety of land in Wonwollyshylle; and in 1306 a moiety of land and premises to one Richard Garlond at Ymbacombe. He was dead, however, in 1311, and had left a son and heir under age; for in that year (5 Edward II.) William de Rous, lord of Little Modbiri, granted Matilda de Hywys the wardship and marriage of Ralph, son of Thomas, in respect of lands in "Stonhouse and Crimel."

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[1] Some of the Valletort family had undoubtedly, however, previously taken name from Stonehouse; for example John or Joel de Stanhust, who gave the canons of Plympton the right of free fishery *per totam terram meam*, attaching a curious condition about the division of the fish: "qd si Batilli nostri pprij ædiuvire sibi obtenuerunt in piscando in terra meo per equalis porcus captura piscum inter nos dividati." He was probably grandson of the Reginald of *Domesday*.

In 1337 (11 Edward III.) there was an accord on a contention between the Prior and Convent of Plympton, and this later Ralph de Stonhouse, touching an annual rent in Schindelhall.

Ralph married a wife named Joan, and had a son Thomas, and he in turn had a son named Ralph, who married Sibil, daughter of William Smale, of Dartmouth. This confusion of Ralphs is enhanced by the fact that in 1345 we have Ralph de Valletorta granting land in Maker.

Sibil de Stonehouse makes a grant as a widow in 1371.

And now again we come to the Durnfords. Stephen Durnford, already noted as acquiring the land of the Bastards in Stonehouse in 1368, marries a certain Cecilia, somewhere between 44 and 47 Edward III. (1370 and 1373), and this Cecilia is believed to have been the daughter of Ralph and Sibil de Stonehouse, in whom that family therefore came to a territorial if not an absolute end.

The first mention of Stephen Durnford I have found is in 1366;[1] thence up to and including 1370 he is named alone; in 1373 and onward the deeds give Stephen and Cecilia. In 1368 Stephen Durnford takes the land of the Bastards in Stonehouse. In 1370 (44 Edward III.) James Vautort, lord of Sutton, grants the release in fee to Stephen Durnford, of Vautordispark atte Pole already cited, and in the same year Stephen and Cecilia are put in possession of a tenement in Sutton Vautort, which had belonged to John Austin.[1]

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[1] There are, however, earlier references to the family in this locality. The earliest with which I am acquainted are contained in the Tavistock Church records. In the fourth year of Edward III., 1330, Robert Ffolke, of Tavistock, granted to Gerard de Durnforde, an annual rent of three pence and a silver halfpenny, issuing out of the lands of Peter de Langeforde, in Woddon; and about the same time Ffolke (as Ffolka) conveyed a garden in Tavistock to the same as Girardo de Durnaford. A Durnford, probably the same, also appears as a witness to a conveyance by Walter Golda to Lavinia, daughter of Robert Ffolke, in the twenty-first year of one of the Edwards, II. or III. There is no Durnford in Devon to give name to the race, and the probability seems to be that they came from Durnford, near Salisbury.

Not long after we find the Durnfords extending their possessions in the other direction; for in 1386 (9 Richard II.) Sir John de Harpsden grants and demises to Stephen and Cecilia Derneford the whole manor of Rame for life, and this was followed up in 1393 (16 Richard II.) by a grant to Stephen of the same in tail.[2]

And thus at the end of the fourteenth century we find the Durnfords practically in possession of the estates in Stonehouse, Plymouth, Maker, and Rame, which afterwards passed to the Edgcumbes.

Stephen Durnford the elder had two sons, Stephen and John, and a daughter Isolda; and in 1394 (18 Richard II.) he executed an entail of his Bastard property—John Hele, chaplain, and William Honyton, granting it to Stephen the elder for life, with remainder to his children in succession in tail.

Stephen the younger married Radegund, daughter of Nicholas Cotterell (there is a statement that she was daughter of Sir William Fitzwalter); John married a certain Joan.

The Durnfords continued in possession of Stonehouse and their other estates until the marriage of their heiress, Joan or Jane Durnford, with Sir Piers Edgcumbe, *circa* 1493. She was daughter of James Durnford, who was the son of James Durnford and Margaret Bykerby (Bigbury),[3] and grandson of Stephen the younger. Her mother was Jane, daughter of John Holland.

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[1] Stephen Durnford had acquired the rents and services of John Golde and other tenants in Sutton Prior and Sutton Wanland, by grant of Walter Attepole, son of John Attepole, in 1367 (41 Edward III.)

[2] Stonehouse formed part of the honour of Plympton. As early as 1404 there was a dispute between the Earl of Devon and Stephen Durnford, touching the manor of Rame; and when he died, in 1410, his son paid the Earl 65s. 8d., a relief of a knight fee's, in respect of that manor. In 1458 James Durnford granted Margaret, daughter of Sir Hugh Courtney, an annual rent of 100 marks, in name of her dower; and in 1460 he did homage to the Earl of Devon for Stonehouse, Tenton (Kingsteignton), and Rame, which he held by knight service. The feudal superiority was maintained during the early ownership of the Edgcumbes; for in 1608 we find Alexander Maynard giving a receipt for 25s. relief on the death of Peter Edgcumbe, for the use of the lords of the Castle of Plympton.

[3] In 1415 William Werthe and others gave seisin of the manor of Stonehouse and passage of Cremil, *inter alia*, to Sir William Hankford for William de Bykebury.

Joan Durnford was twice married—first to Charles Dinham, by whom, of course, she could have had no issue, or none that survived. The manor has now been in the Edgcumbe family just 400 years—as long as all its previous owners since the Conquest together.

It was under the Durnfords that Stonehouse began to develope from a hamlet into a village, and to progress from its small beginnings to the "conveniente bigge towne well inhabited," which Pole describes it about the end of the sixteenth century. James Durnford the elder was particularly active, for in 1448 (26 Henry VI.) a dispute was settled which had arisen between him and the Abbot of Buckland, and which had its origin in the assertion by Durnford of territorial authority.

The Abbot of Buckland held the hundred of Roborough and view of frankpledge therein, and complained that Durnford had "caused to be set-up a certain pillory and tumbrel at Estonhouse and a certain court to be holden at Estonhous, within the precincts of the hundred aforesaid, and there had caused to be presented in his court aforesaid by his ministers the assize of bread and ale there levied, and effusion of blood and of arms and injuries done against the peace, and other articles, which ought to be presented in the view of frankpledge at the hundred aforesaid." The dispute was referred to the Prior of Plympton and James Chudleigh, as arbitrators, and they gave judgment against Durnford, ordering the pillory and tumbrel to be destroyed; the abbot and his officers to have rule as theretofore, and that Durnford should pay the abbot £20 as costs.[1]

Stonehouse was, however, distinctly recognised about this date as a part of what I may call the Duchy port of Plymouth, for there is a writ extant, July 28, 1479 (19 Edward IV.), in the name of Edward Prince of Wales, to the underbailiff of the water of Sutton Pole, directing the summoning of twelve men of Plymouth, six of Stonehouse, six of Yalm and Newton Ferrers, and six of horston (Oreston), for a court to be held on the 7th August following, before Nicholas Henscotte, *locum tenens*.

There are extant a few entries of manor courts of East Stonehouse in the reign of Henry VII., which give details of names of residents, and of the mode in which the manorial government was carried on when the Edgcumbes first came into possession. The jury at the court held June 26, 1493 (8 Henry VII.) were John Bastard, John Hunne, sen., Abraham William, Matthew Boyes, Nicholas Lucas, Philip Hoper, Walter Seyncler, Thomas Holand, John Vggon, John Blerek, Stephen Adam, John Jenyn, Thomas Bole, and Walter Matthewe.

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[1] Yet the value of the abbot's rights could not have been very much, seeing that they were granted in 1498 to Sir Peter Edgcumbe at an annua rent of 5s. ; even though another authority says 20s.

The following were presented because their houses were ruinous (domas suas esse ruinos)—*i.e.* out of repair—and they appear to have been fined 1d. each: John Maye, Dionysius Guynne, Lawrence Durgan, William Hotewyn, Thomasine Roberd, Galfrid Grose, John Vggan, and Richard Symon.

Richard Denys, John Dorsett, and Richard Bonde were fined 3d. each for certain defaults.

Richard Wadam, jun., Thomas a Chamber and Johanna his wife, Philip Hurde, Hugh Walys, Robert Bastard, John Milet, John Guygge, Walter Wilcocke, Edward Purton (?), and John Thomas were presented for having dung on their premises near the quay, and fined 1d. each.

John Bastard, Nicholas Lucas, and Thomas a Chamber did homage to the lord.

Abraham William, Alice his wife, and John their son, had a tenement and a garden adjoining Newport Street—Henry Bartelet north, and Thomas Hole south, at 12s. 4d. a year rent.

John Wegge, Johanna his wife, and John their son, took a tenement that Isabell Skere had held.

Harwand Richard, Johanna his wife, and Walter their son, took a tenement that Richard Denys had held.

The names of tenants mentioned at other courts held at this time include Richard Boyes, Philip Stoford, William Wyleske (under steward), William Hole, Serlo William, Shannan Mylle, Henry Snitbond, jun., John Lawry, Richard Symons, jun., John Mayne, Richard Nogell, William Michell, Richard, John, and Roger Tamerton, William Whyte, John Wode, John Bleryoke and Alice his wife, Alice Perys, Peter Chynnow, John Mistow, John a Mayer, Peter Bassamy, John Morysh, and William Heryng, who had a gutter out of order.

The sanitary entries are set out clearly enough, the offence being stated in one case, "Habent fumus iacent in regia strata apud la key . . . . quod noc vicin—tocius ville;" and "Habent fumus et alia vilia iacent in vico ad noc."

Pleas of debt and other disputes were likewise settled at the court; for example Stephen Adam and Alice his wife, were to satisfy John Hunne with 3s. 6d. for bread bought of him—"per pane ab eo empt."

The general duties of the tenants of the manor are shown by an entry in the same year (8 Henry VII.) that a place called "le key" was out of repair; and that it was the part of the tenants to repair the same—"Omnes tenentes de Eststonhouse repar tenenta." So they had a day fixed, the octave of the nativity of St. John the Baptist, by which sufficient repair was to be made, under penalty of a fine of 40s.

The total receipts of the two courts held this year were—court fees 5s. 8d., fines of lands 16s. 4d., injuries 3s.; while a silver cup, cipheas argenti, was taken as a heriot in the case of Philip Hurde, jun. The seneschal's or steward's expenses were 14s. 2d.

John Knebone was bailiff of East Stonehouse in the latter part of the fifteenth century; and a note of his accounts from Michaelmas, 11 Henry VII., to Michaelmas, 12 Henry VII.—1495, 1496—has been preserved. The rents of assize were £41 0s. 2d.; the customary works—"de opibz custum"—11s. 6d.; total, £41 11s. 8d.

This shows a very considerable increase in the size and importance of the place relatively, not merely since *Domesday*, but much more recent times. What Stonehouse was under the Durnfords in the middle of the fifteenth century, is fairly indicated indeed by a deed of grant of James Durnford, in 1462 (1 Edward IV.), of arable land and waste in East Stonehouse, "except the village there, all messuages, &c., and a small close called Pese Park, otherwise Buthay, and except common of pasture for horses of fishermen on Wynrigg, Whyttor, and the hill near Horspool."

Here we have Stonehouse called a village; but we can get more than a century further back.

A record of the "fifteenth" paid in what we may call the Plymouth assessment district in a mayoralty of Thomas Clowter—1537, 1544, 1551, or 1556—supplies some indication of relative value at the time the assessment was first made. The four wards of Plymouth town paid between them £22 19s. 2d.; Kingstamerton 10s.; Maker 10s.; Stonehouse 2s. 6d.; Vawtars ground 2s. 6d.; Houndiscombe 16d.; and Tungesland 8d. An extra £12 was then levied in Plymouth, in the same proportions in each ward as the old assessment; and Compton paid 6s. 8d.

Now this "fifteenth" had been a fixed amount payable as a composition by each community from 1334; and these figures therefore give us a clue to the very small importance of Stonehouse ere it came into the hands of the Durnfords. It was but a fourth the value of Maker; not double that of Houndiscombe; and as the "fifteenth" was a tax levied on moveables or personal property, it will be seen that the population of Stonehouse must have been very small, and its portable wealth very limited.[1]

Under the Edgcumbes, Stonehouse made rapid strides. Its new owners proved themselves men of business tact and energy.

We are indebted to Mr. R. Dymond, F.S.A., of Exeter, for documentary facts touching the erection of the Stonehouse Mill Bridge, by Sir Piers Edgcumbe, about the year 1525. By deed dated May 8 (17 Henry VIII.), John Wise, of Sydenham, lord of the manor of Stoke Damerel, granted, demised and confirmed "to Peter Eggecomb Knight one parcel of our land in Estelake, otherwise called Dedlake within the manor aforesaid, containing in itself from the middle of the salt-water running between Este Stonehous and the manor of Stoke Damerell aforesaid, in length one hundred and sixty-four feet and in breadth forty feet, to erect, raise, construct, and build one wall or work called a causeway, for certain corn-mills to be newly built and constructed upon the said wall or work, together with a reasonable way of going and returning for all and singular the subjects of our Lord the King, with all carriages, on our land in Estlake or Dedlake aforesaid, that is to say, as well from the said mills unto a certain way leading from the Parish Church of Stoke Damerell aforesaid towards Plymouth, as from the said way unto the Mills aforesaid—To have and to hold all the aforesaid parcel of land with the Mills aforesaid, together with the said reasonable way, to the aforesaid Peter Eggecomb for the term of his life, Paying therefore yearly unto me the aforesaid John Wise and to my heirs twelve pence sterling, to be paid at the feast of St. Michael the Archangel for all services and demands. And after the decease of the said Peter Eggecomb we will and grant that the aforesaid parcel of land with the mills and way aforesaid with their appurtenances absolutely remain to Richard Eggecomb, the son and heir of the said Peter, and to the heirs of his body lawfully begotten."

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[1] There has been preserved a curious entry of an inquest held at East Stonehouse, December 10, 1502 (18 Henry VII.), before John Bekette, coroner of the King in Devon, on the body of Robert Mathew, jun., of Eststonehous, fysher, on the oaths of Henry Elerycke, Walter Gawe (?) *alias* Synkeler, John John, John Sawter, Reginald Phylypp, John Noune (?), Stephen Adam, Reginald Carter, John Elerycke, jun., Thomas Chelway, Thomas Maryner, and Thomas Martyn, whose verdict was that on the 8th December, at 11 p.m., John Croste (or Creste), of Lypson, groom, stabbed Mathew in his belly at his house at Stonehouse; Elizabeth, Mathew's wife, being an accomplice.

The deed goes on to confirm the grant in succession to the various members of the Edgcumbe family, children of Piers, and in their default to the right heirs of Joan Edgcumbe (Durnford), "late wife of the said Peter."

This causeway was made, as appears by a later grant of confirmation to Sir Richard Edgcumbe, son of Sir Piers, within three years of the date of the original deed; that is, about the year 1528. The later grant, dated July 6th, 34 Henry VIII., sets forth that John Wyse had granted "that hitt shuld be lafull for the sayd S^r^ Pyers & his heirs as afore ys sayd att all & every Place & Places Tyme & Tymes that they shuld thyngke moste mete & convenyent to sett fyx & make mills cawses werys ffryghts Brygges ways & Poolys & all other Comodytes to there moste Comodyte profitt and advauntage by reson whereof the sayd S^{r} Pyers wythyn iii yers next after the sayd xxii yers or nygh thereabowte to his no lytle cost charge & expencs dyd mke & cawse to be made a cawse mills & a Brydge over thawrtt the sayd water with a way to hie & goo from the sayd mills as there at this present Day more playnly apperith of all which Premysses the sayd S^{r} Pyers dyed seasyd of yn hys demene as of fee Taylle for whche the seyd S^{r} Pyers durying his Lyff & the seyd S^{r} Richard his son have yerely trewly contentyd and paied the sayd xii^{d} of rent of & for the Premysses. In Consyderacion whereof & becawse the sayd mills cawse Brydge & Way ar & be very comodyous & pleasaunt for the sayd John Wyse and all his Tenaunts dwellyng yn Stoke Damerell aforsayd the sayd John Wyse by this present Indenture affyrmyth confirmyth coroboratyth every artycle clause & sentence yn the sayd wretyng made to the sayd S^{r} Pyers

& his heirs according to the trew meanyng & Intent thereof afore expressed for ever more. And Ferder the sayd John Wyse by thys present Indenture bargenyth gevith convenantith & grauntith to & with the said S^r^ Richard Eggecomb that he the sayd S^r^ Richard his heirs and assignes shall have hold occupy & ingoye the sayd Mills Cawse Were ffrythys brydges ways pooles and all other Comodytees by them made or to be made to there most proffytt comodytey & advauntage withoutt lett or interupcion of the sayd John Wyse or of his heirs for ever."

A lease of Peter Edgcomb, Esq., to John Robyns of Plympton in 1588 (30 Elizabeth) of premises north of the High Street, and south of the "Stronde of the Salte streame;" that is to say between the High Street and Stonehouse Lake, immediately above the present bridge, supplies us with interesting particulars of the more settled conditions of local government which the manorial constitution of the township had then assumed. Robyns agreed "to obaye pforme & fulfill all suche Rules & directions & orders as the said P[eter] E[dgcomb] & his heirs w^t^h the consente & francke agremt of xij discrete & able psons of & w^t^hin the said Towne and liberties either before this tyme have or shall at anye tyme or tymes hereafter agre on, & sett downe for the Weale good estate & government of the said Towne, & of the people w^c^h for the tyme beinge shalbe resydent & abydinge w^t^hin the same."

There are very few local place-names of this period extant that we are able clearly to identify. Wynrigg, Whyttor, and the hill near Horspool, have been mentioned. Wynrigg was unquestionably in part, if not altogether, what is now known as Battery Hill. To Whyttor there is no direct clue, but in all probability it is connected with the site long called Whitehall, possibly a corruption. The hill near Horspool must, I think, refer to some part of the ground on which the Royal Naval Hospital stands. We have, however, Northyll named in a grant in 1455 by James Durnford for life to William Durnford, bastard, of land that Janyn Carpenter held; and Southyll Street occurs in 1474. We get North Street in 1540, and two years later St. George Street.

East Stonehouse has been frequently named. The earlier documents mention Stonehouse only, without any distinctive epithet, and the first record I find of East Stonehouse is in 1369, under the name of Esterestonhouse. At that date, therefore, there must not only have existed a West Stonehouse, but it must have grown so large as to make the need of distinction felt. Why the new village across the harbour should have been called Stonehouse at all, instead of Cremill, is open to speculation, but the fact may indicate its origin when the Stonehouse family were in possession; and it owed its existence no doubt to the ferry.

Almost the only historical allusion to West Stonehouse is found in Carew's *Survey*, where it is said:

"Certain old ruines yet remaining, confirme the neighbours report that neere the waters side, there stood once a towne, called *West stone house* until the French by fire and sword overthrew it."[1]

Several references to West Stonehouse are found in the Edgcumbe muniments. Thus in 1494 (9 Henry VII.) we have the final concord and agreement in which Peter Eggecomb and Joan his wife were deforciants, and which refers, *inter alia*, to the manor of East Stonehouse, a moiety of the manor of West Stonehouse, and "a passage beyond the water of Thamer called Cremel Passage between West Stonehouse and East Stonehouse." In 1545 both West Stonehouse and Cremyll are named as manors in the county of Devon. It was in this year that the Royal license was granted to enclose and empark lands and premises in West Stonehouse and Cremel (with free warren and several fishery in West and Est Stonehouse, county of Devon, and Cuttele, county of Cornwall) which led in a short time to the building of Mount Edgcumbe House.

The variation of names noticeable from time to time in dealing with these properties is very curious. Stonehouse itself only turns into East Stonehouse; but the original Macretone and Crimel develope into West Stonehouse, Cremil parish of Maker, Maker otherwise Makers within the parish of Maker otherwise St. Julyans, East Maker, West Maker, Mount Edgcumbe, and the manor of Mount Edgcumbe alias West Stonehouse. Mount Edgcumbe, of course, took name from the fact and date of the erection of the mansion house there by Sir Piers Edgcumbe *circa* 1553; and there was, and still partially is, an old name connecting it with the Valletort lords, as the tithing of Vawtersham, or Vaultershome.

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[1] Folio 101a.

The early relations between Stonehouse and its important neighbour, Plymouth, seem to have been on the whole friendly.

"Jamys Durneford, late of Estonhouse, squyer," left a legacy of £20, which is recorded in 1480 as having been applied towards making the "southe Ilde" of St. Andrew Church.

A very interesting entry, the earliest of the kind, in 1494–5, shows the good feeling between the town of Plymouth and the Edgcumbe family, soon after they succeeded to the Durnford property, which then included in Plymouth itself the now extinct and forgotten manor of Sutton Radclyffe.

"Coste done to mast^{r} Eggscomb by advys of m^{r} mayr m^{r} Record the xij & the xxiiij when he was made knygt and shyryff.

"ffirst for ij Sug^{r} loffe weyeng xli qrtr iiijli qrtr y^{e} of at xvij^{d} and y^{e} vjli at ij v^{d} sm^{a}	iij^{s} xi^{d}
"It ij botells of Redde wyne pce	ix^{d}
"It a potell of Malmsey	viii^{d}
"It a Galon of Clarett wyne & bayne wyne	viii^{d}
"It a botell of bastard	v^{d}
"Ib do dos of pownegarnarde a pownde sedo & a dos do of Orenge."	viij^{d}

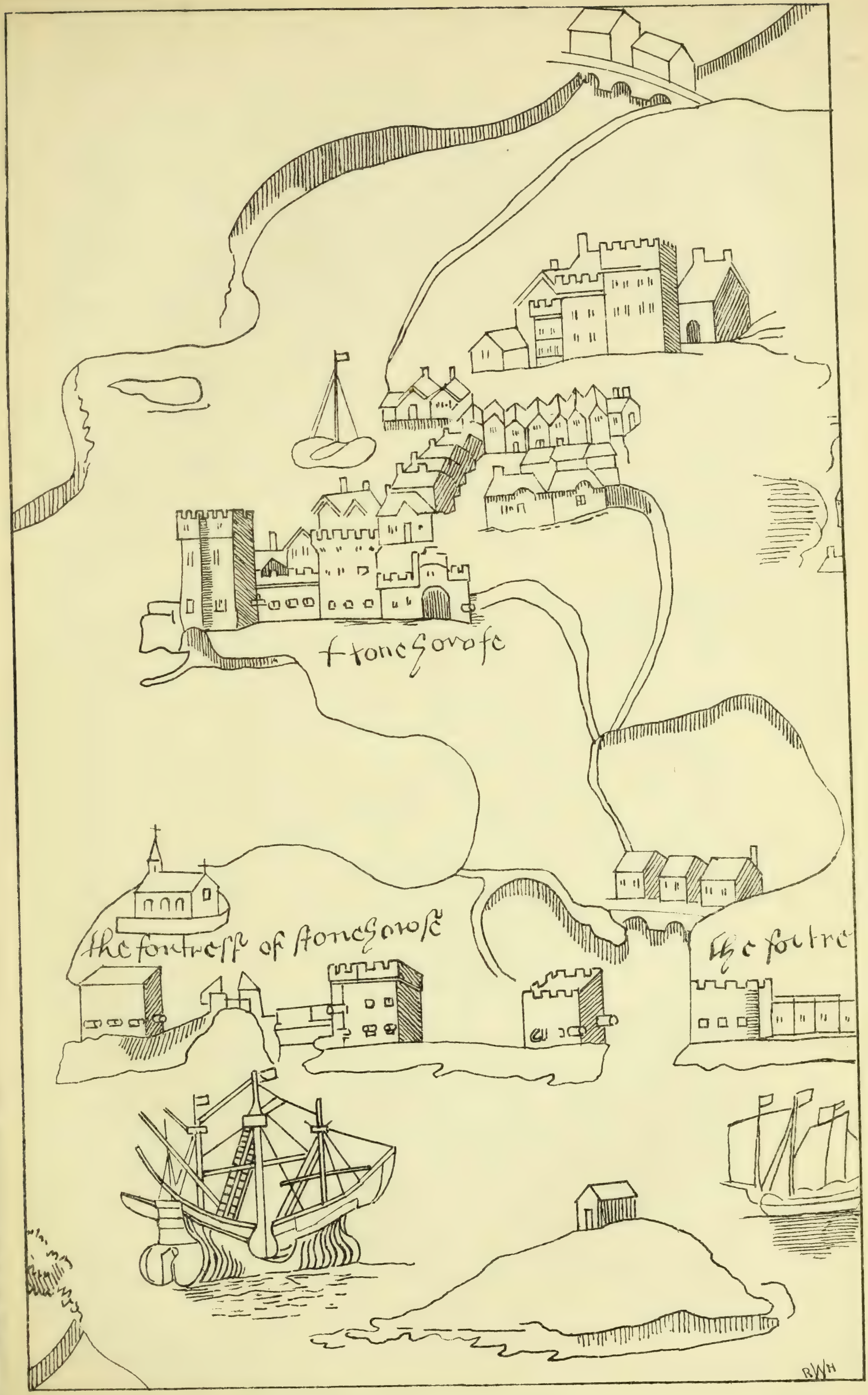
And so I may quote as illustrative samples of good fellowship between the towns the following:

"1512–13. Itm for a barell of ale & for bredde to make the men of Stonehouse to drynke when they were here at mavster	iij^{d}
"1530–31. It p^{d} for Sr pyrse Eggecombs dynn^{r} when he had Communycacion with master mayre & his Councell of o^{r} libertye of o^{r} water of soure pole mylls	x^{s}
"1545–6. Itm pd for drynke on maye daye for the men of stonehouse	iij^{s} iiij^{d}

Forty years later there are less satisfactory entries. For example:

"1587–8. Itm for Conveyinge to Stonehouse of the dombe man that was made to speake."	ij^{d}

If this stood alone it might be imagined that the dumb man had been forwarded as a curiosity; but unfortunately there are too many entries of rogues and vagabonds being sent in the same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direction. Still it is pleasant to find that the discharge of moral rubbish did not altogether sever friendly ties. There are subsequent entries of not only drink but wine being given to the "Stonehousemen" on May-day. The town was also made the scene of occasional feasting. Thus when, in 1602, a dispute between Plymouth and Saltash was brought to a close, the mayors of the two boroughs dined together at Stonehouse, as neutral ground, at a cost of 26s. It was at Stonehouse that the commisioners of Devon and Cornwall sat in 1643, when they tried to patch up a peace between the two counties, while the rest of the kingdom fought it out. Stonehouse is said to have followed its owner in its Royalist proclivities during the civil war; but it was included within the defence and authority of Plymouth, and if the Churchwardens' accounts are any guide, Puritan feeling must have been predominant there also.

Valuable information on the extent and character of Stonehouse in the early part of the sixteenth century is afforded by the sketch bird's-eye map of the Cornish and Devon coasts in the British Museum, reproduced in sections by the Lysonses, and a *fac-simile* of the local portion of which is appended. Stonehouse is there shown as a small town, somewhat bigger than Saltash, but barely a fifth the size of Plymouth. The quay is indicated near the present bridge, practically on the site of the present quay, with houses fronting on the water. High or Fore Street can be made out, and what is now Chapel Street. The most distinctive features of the town are, however, two large embattled buildings —one on the north of High Street, and the other next the water on the site occupied by Whitehall and Stonehall, and stretching some distance inland. The latter building has a high tower next the water, is fortified, and has a gatehouse. This is the old residence of the Durnfords, occupied as such by the Edgcumbes until the erection of Mount Edgcumbe. It was a structure of much pretensions, the most important in the locality, and in part of considerable age, dating no doubt originally to the occupation of the Stonehouses, though unquestionably improved by the Durnfords, and mainly their work. The embattled outer wall of the enclosure of this manor-house still in part remains on the south of St. George Churchyard.

The other building seems of later character, and less distinctly defensive. Here too a massive square block forms the leading feature; but the impression given is rather that of an ecclesiastical edifice. It continued in existence up to about the middle of the last century, when it was known as the "abbey." It was removed when the Royal Naval Hospital was built, as it stood upon part of the western site of that establishment. The main building formed three sides of a quadrangle, and a gateway crossed the road on the south at its centre.[1] A large and well-planted garden adjoined, and what appears to be a remnant of the garden wall bounds the garden now occupied by Dr. Payne on the north.

There seems no trace of any ownership by the Priory of Plympton of lands in East Stonehouse, nor of the presence of any conventual establishment there, save the existence of this so-called "abbey." Plympton Priory had lands at Cremill, for in 1522 (14 Henry VIII.) there was a demise by John Ryle, Prior, and the Convent of Plympton to Sir Peter Eggecombe and his wife, of premises in Cremell within the parish of Maker; and in 1545 John Pope was licensed to alien lands in Cremil parish of Maker, late parcel of lands of Plympton Priory, to Peter Edgcumbe. Sundry lands which had been ecclesiastical at Plymouth—"the hermitage of our Lady at Quarrywell"—once belonging to Plympton Priory; lands part of Jaybean's Chantry, lands of the Grey Friars, and other lands "dedicated to superstitious uses" in Plymouth, granted to Edmund Grimston, father and son, were eventually acquired by Sir Peter Edgcumbe; but none of these can be connected with Stonehouse. It does not seem unlikely, however, that the "abbey" belonged to the Cistercians of Buckland, whom tradition reports to have had an establishment in Plymouth or its vicinity.

There is no church visible in the map in the town itself, but one is shown on the high land of Devil's Point, on ground since cut away for the Victualling Office. It is a little structure of distinctive character, quite unlike the other churches drawn—simply a nave and chancel, with a spired bell-turret at the west end, and standing in an enclosure. With the exception that the latter has a transept of Perpendicular date, this fabric corresponds very closely to the drawing of the church of St. Lawrence by Payne, reproduced by Mr. Brooking Rowe in his *Ecclesiastical History of Old Plymouth.*

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[1] This gateway, and that of the manor-house, at the head of Chapel Street, were, I take it, the "barrier gates" recorded as removed in 1770; for Stonehouse was never walled.

That there was a chapel of St. Lawrence at Stonehouse is evident from a license granted in 1472 to Magister Johannes Stubbes, perpetual vicar of the parish of Plympmouth, to depute a priest to celebrate divine service in "capella sancta laurencij apud Stonehowsse," within the said parish of Plympmouth, without prejudice to the rights of the mother church. But as we shall see, there was a chapel of St. George at least in 1497, and I take it that this was the one replaced by the present hideous structure in 1789. When did the chapel of St. Lawrence disappear? It corresponded very closely in position as regarded Stonehouse to the chapel of St. Katherine on the Hoe, to Plymouth; and may have originated as a place to offer prayer for preservation from the perils of the dangerous ferry: for very dangerous Cremill Passage appears to have been regarded throughout the Middle Ages. And no doubt the transit was often attended with considerable risk, having regard to the strong set of the tide, the exposure to wind, and the frail character of the boats. That a chapel should be erected at such a place is just what we might anticipate from mediæval piety; and since the ferry as an accustomed passage certainly dates back to the thirteenth century, the chapel may have been originally the work of the Valletorts, and in all likelihood was.

The earliest reference to the establishment of religious worship at Stonehouse with which I am acquainted is, however, a license granted to Stephen Durneford and Radegund his wife, for their mansion of East Stonehouse in the parish of Plymouth, September 28th, 1414.

It is quite possible that this may have led to the erection of the chapel of St. George, hard by their residence; but however that may be, we find certain property which had been granted by the feoffees of James Durnford the elder (James Durnford the younger, William Carver of London, John Tanton, parson of the church of Rame, and William Dernefford) in 1474 (13 Edward IV.) to John Bastard, made the subject of a grant, December 24, 1497, in favour of John Melett and Lawrence Serle, chapel wardens—"custod capell sci georgii martii de Est Stonhous"—for the use of the same chapel.[1] This shows that the chapel of St. George then existed, and that it had a quasi parochial status. St. Lawrence was so inconvenient for the bulk of the residents, that it may have been abandoned for St. George.

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[1] It was a garden in 'Southyll streteyshynde,' or the end of Southhill Street: Wynrech Down south, Calisparke east, king's highway west, tenement of Margareta Willyam north. Tenements of John Crokker and John Merser, subsequently Harman's and Seyntcler's, are also mentioned as boundaries.

So far as I am aware this is the first time that contemporary evidence has been cited of the existence of two chapels at Stonehouse in the fifteenth century—St. Lawrence and St. George. It has been suggested that there was but one edifice, bearing the double name or dedication; but this hypothesis I think cannot be sustained. The map is certainly very good proof of the existence of a chapel at the Passage; but while the conditions under which the predecessor of St. George was removed in 1789 to give place to the present structure are fully known, it must be admitted we are wholly without information as to the disappearance of St. Lawrence. It is not to be identified in Northcote's view of the Long Room in 1769, though there is a building shown very near its site.

However, there is secondary collateral evidence which is worth consideration. The "Ruins" at Mount Edgcumbe, and the alcove at Picklecombe, contain fragments of mullions, tracery, doorways, and other details from Gothic buildings, which are usually assigned to ancient edifices at Stonehouse, and I believe correctly. Still it is not absolutely certain that this was their sole origin. Lord Mount Edgcumbe has kindly informed me that the field west of the avenue at Mount Edgcumbe is called Chapel Meadow, which seems to indicate the former existence of an ecclesiastical edifice there (and the fact that Plympton Priory had property at Cremill will be borne in mind), possibly in the first place connected with the ferry, and subsequently used by the dwellers in West Stonehouse. The old barn at Barnpool was also of Tudor character. Both these buildings, therefore, might have contributed to the collection of fragments.

There is, however, no tradition on record to this effect; and a examination of the remains points clearly in the other direction. Both at the "Ruins" and at Picklecombe I find distinct evidence of the demolition of two buildings, the one Early English, thirteenth-century, and the other Perpendicular, and in part late. The chief remains (and they only have any architectural interest) are Early English, cut in Roborough Down stone. The Perpendicular work is in granite, possibly from two localities. At the "Ruins" are deeply moulded jambs, window heads, cinquefoil and other, with mullions and quoins, of Roborough stone; and at

Picklecombe an elegant little piscina, in the same material, with bases, &c. The Perpendicular work at the "Ruins" consists of fragments of granite windows, with doorways, and a crocketted finial; while at Picklecombe the arch of the alcove is of the same date and material. The portions of the two buildings have been mixed up in a very odd way, parts of windows, moreover, being worked into doors, and those of doors into windows; while at Picklecombe the whole work was supplemented when the alcove was built, in Portland stone.

Now the Perpendicular remains seem too considerable in their way (knowing what we do of the old chapel of St. George, as set forth hereafter) to allow of the Early English having formed part of the same edifice. On the other hand the Early English are quite sufficient in themselves to account for such a fabric as that of St. Lawrence must have been, without the granite. Moreover, what we know of Stonehouse in the thirteenth century and well on into the fourteenth, forbids the idea that such an edifice as the Roborough stone fragments indicate would have been wanted for the inhabitants; while in the fifteenth century the need of such a place of worship as that to which the granite dressings belonged was undoubtedly pressing.

My belief, therefore, is that we have in the Park remains of both buildings. That Roborough stone was used for dressings in the locality generally, early in the thirteenth and on into the fourteenth century we have proof in the Transitional Norman arch in our Museum, no doubt part of the original St. Andrew Church; in the earlier dressings of the Friary, and in the little desecrated chapel of St. Anne at Hooe. It was never to my knowledge, however, used in our Perpendicular work—even when that replaced other buildings—granite being employed in its stead.

This brings us to the oldest public record of the community of East Stonehouse, an ancient Churchwardens' Book, commencing in 1594, and continuing with intervals down to the year 1779. The original intention was clearly to make this volume a record of all the public acts of the parish, and it was begun in a very methodical and careful fashion. Irregularities soon, however, crept in; entries were made casually as occasion served, and they are anything but complete. Moreover, the earlier pages are very decayed and fragmentary. Still the volume is of considerable historical value.

That it was intended to be a great deal more than a churchwardens' record, is evident from the title, "The booke of accom[ptes of the] towne of Eas[t stonehouse]."

The first entry is that of Robert Brockedon and Andrew Leate as wardens; and then follow in successive years James Barnes and William [ffrie]; John Warren; George Moyle; John Dawe and Roger ffayrewether; John Warryn and John Lawry; Roger ffayrewether; Richard Spurrell and Edward Evarre (?); [Sidrak] jorie; . . . and Mr. Brocadon; . . . and William ffry; [G]eles Jest. To neither of these entries does any date now remain; but there seems no reason to doubt the endorsement of a later hand that the book commenced in 1594—in fact that date occurs—and that those persons were chapel-wardens in the closing years of the sixteenth and opening of the seventeenth century.

Associated with these are a few suggestive entries of a business character.

"It is agreed that the wardens shall pass their accompt yearly upon Saint James . . . . . twenty shillings to the use of . . . " —evidently a penalty for non performance.

Under 1602 are the words "John Trevill Elected"—with subsequently a scratched-out account of John Trevill for "playes and other pfitts;" while in the same year (1602) we have "John Warren oweth to . . . . his play."

An entry of which the date is gone sets forth that on the 18th November, Joseph Hallet and Petter . . . ett, "collectors for the water," had passed their accounts, and paid over to John Lawry, "Deput warden [for] James Barnes, deceased, 24s. 6d.," sundry allowances making the total 26s. 3d. The date is probably 1606, since elsewhere we find Lawry mentioned in that year as deputy for Barnes, and accounting for £3 1s. quarter pence; the quarter pence of the previous year (Richard Spurrell and Roger ffearewether) being £3 8s. Both Lawry and Rodger farewether are named as acting in 1607, and in this year there are notes of payments made on the church, for nursing the sick, and to "maydes at whitsonday!" whatever that may mean.

In the next dated entry—1612—ffearewether pays for two years rent of the chapel green, apparently 32s., and is acquitted in the book after a fashion which subsequently became usual, by the signatures of "Alex Ferrel, sidrake Jory, John . . . ., Richard Browne, J. Hingston (who marks), Wm. By . . ."

The next entry is of peculiar interest, as showing the connection between the parish and the manor: "1613 Att a lawe court holden at Stonehowse, the [eighth] Aprile 1613, Sidrak Jory is chosen warden of . . . foresaid and at the same court Rodger ffeareweather . . . . . hallet is chosen collectors for the Poore the . . . . Parker and John Deye is appoynted collectors . . . . the bringing home of the watter for . . . . [This is attested by the signatures of] alex Ferrel, Rodg . . ., John Hingston, John Challons, Philip . . ., Sidrake Joary, Thomas Hawker, Joseph Hallet [who marks with an H] . . ."

The only entry of definite payment on account of the water is in 1620, when Joseph Hallet and . . . . huchins report a receipt of 39s., of which part was from Lawry for the chapel green, and 28s. had been "gathered of the town." They had disbursed 32s. "to Mr. Beyle and William . . . . for bringing home the watter.' It may be added that this was done under a special Act of Parliament obtained by Stonehouse for the purpose in 1593, in virtue of which the Stonehouse waterworks still exist, and portions of the original leat.

Other wardens named are :—1614, John Hingston; 1616, . . . Huchins; 1617, J. Hallet; 1618, James Phillips; 1719, Edward Jeffry; 1620, Francis Roe; undated—John Masters, whose account is the first perfect one; 1625, Richard Roe and Richard Spurrell; 1626, John Masters, in whose year great sickness is recorded; 1627, Richard Spurwell; 1628, Francis Roe; 1629, . . . Lawry; 1636, Robert Crees; undated, John ffearwether; 1639, George Ogle, who acknowledges money towards "the repayration of the chapell," which thus dates the enlargement of the fabric, hereafter noted as the "new chapel;" 1640, Roger Toope; 1641, Elize Randle—here the new chapel is first named as such. Randle is also warden in 1642, in which year £7 19s. 10d. are spent on the poor, partly collected, and partly taken out of the box and gathered on fast-days. Lawry follows, and then a warden whose name is lost; after which there is no entry until 1652.

During the Commonwealth the record is kept with exceptional regularity :—1652, Robert Cane, warden, John Gefferye, assistant. There is a curious touch of Puritanism in the entry—"Tho: Gefferye for ringine the Bell or rather towards his necessitie a shirt." 1653, Richard Tapson, chosen by the "Church of Plymouth," but of a Stonehouse family. 1654, John Adams, chosen by the "Church of Plymouth;" he allotted 33 seats at payments varying from 6d. to 8s. 1656, John Gefferye and Thomas Conter "chosen wardens of the chapple;" a new bell turret and bell put up, the "punnon end" being plucked down to the window, and the bell cast at Exeter. 1656, William Matthew; 1657, Jacob Whiddon, "by the church of Plymouth for the chapel of Stonehouse." 1658, Richard Tapson, continuing on apparently until 1669. 1669-72, William Matthews. The next entry of appointment is in 1697. John Earle is then chosen chapel warden by the town, and continues in office until 1701, when he appoints Richard Crestopher and Reuben Dier his successors, handing to them one surplice, one silver chalice and cover, two pewter flagons, one plate, and a table cloth and napkins. The flagons and plate had been bought in 1697 for 8s. 6d. "Payd Mr. Pile the gooldesmith for a bole with a civer to itt of sillver 03—03—0." This, of course, was the chalice. In 1700 William Benett was constable, and James Axford overseer.

There is a memorandum of a long-forgotten charity. "Memo. that in 1631 Mr. Thomas Brockentton of Eastonehowse, merchant, left £ . . 3s. 6d. for the maintenance of the poor there, a band to be given for it by William Tapston, Richard Spurrell, [Robert] Merring, Edward Phillp, George Coffin, George Ougle, the interest to the poor." It is not certain what the amount is, as the end of the line before the figure 3 is gone; but accounts of the charity from 1639 to 1647, by Robert Merring, put the capital at £49, given by Thomas Brockenton and Mr. Edward Mann; the interest with one exception being £4. One item of expenditure is "making up the wall of the almshouse," but most of the money went in food and clothing and placing children out. After 1647 there is no mention of this fund.

A list of subscribers to the bell turrett, put up with a new bell in 1655, at a cost of £26 19s. 9d., is worth quoting for the personal information given: "Daniell ffish, 2s.; Hugh Hingsone, 5s; Rd. ffoot, 3s.; Wm. Reth, 2s.; Jn. Martine, 2s.; James Leane, 2s.; Jn. Kitt, 2s.; Rt. Downman, 2s. 6d.; Cathern Birch, 6d.; Elias Randle, 1s.; Wm. Hunking, 5s.; Anthony Southard, 1s.; Edward Brooking, 1s.; Peter Addams, 4s.; Anthony Merrifield, 2s.; James Merrifield, 1s.; Eliza Wyat, 1s.; Kath. Cromton, 5s.; Mr. Rowes, £1; Capt. John Jefferye, £1; Dr. John Rombelow, £1; Jn. Lawrie, £1; John Gefferye, £1; Rt. Cave, £1; Wm.

Matthewes, £1; Rt. Merring, £2; Jacob Whiddon, 10s; Thos. Gefferye, 5s.; Rt. Cooper, 5s.; Gregory Bodie, 5s.; Jn. Clowter, 3s; Rt. Kitt, 6d.; Jn. Sterman, 1s.; Eliza ffairweather, 1s.; John Jenking, 1s.; Arthur Dawes, 2s. 6d.; Oliver Rogers, 1s; James Seuckey (?), 5s.; (the amounts given by the remainder are worn away) Wm. Hawkings, John Lang, Thos. Halye, Nath. Coadd, Walter Stockman, Rt. Prout, J. Robens, Martyn Sonders, Js. Steevens, Jn. Chafe, Rd. Hex, Greg. Hooper, J. Marij (?), Alex. Ogle, Eliza Edgcomb, Eliza fforde, Rd. Daw, Margt. Herring, Markes Hunken, Rt. Hooper, Rd. Dunridge, Jorden Sprye, Jn. Tooker, Js. Peares, Js. Steevens, Joan Hooper, Mr. Vaughan, Adrian Anthony, Ben. Brocken, Jn. Steevens, Thomas Steevens. Rabish Stone and mother, Edward Browne, Jane Mangles, Joan Richards, Thos. Pitcher, Wm. Liscomb, John Masters, Edward Canter, Thos. Canter, Roger Kitt, George Orchard, Richard Tapshan (?), Edward Philp (?), Nicholas Langworthy (?).

Several of these names also occur in connection with the contemporary history of Plymouth, and the list as a whole clearly shows that however Royalist Stonehouse may at one time have been, it was by this date decidedly Puritan. I am inclined much to doubt, however, whether the strength of the Royalist element in Stonehouse has not been exaggerated.

The first ministers mentioned in the book are in 1656, when "Mr. Cortney, the minister," had £2 10s.; and "Mr. Code, the minister," £6. Ten shillings was spent on a journey to Brent to fetch £9 under a composition from Mr. Jellinger, minister of that place. He was at one time connected with Stonehouse, for his seat is mentioned. A Mr. Walmsley is said to have been minister in 1662, and to have conformed; but he is not named here. In 1701 Edmund Venning signs as "minister," and in the following year as "curate." Then we have—1711, "Peter Bellinger, minister;" 1712, "John Harris, minister;" 1715, "Rcd of Canon Gilbert out of his tithe for Mr. Hunt teaching nine Sundays at the Chapell £1 2s. 6d." Hunt was paid a half quarter's salary £3 15s., and £1 2s. 6d. for two Sundays more, March 28, 1716. Mr. Smart had £2 10s. April 21, 1715, so that he seems to have preceded Hunt. Next we have—1724–5, "George Williams, curate;" 1731–2, Mr. Stephens, minister, a quarter; 1732, Mr. Alcock, four quarters; 1733–35, Mr. Bedford, twelve quarters to Christmas, 1735. October 23, 1740, to March 25, 1751, Mr. Josias

Foot signs receipts as minister; July 14, 1751, to Jan. 24, 1752, Mr. John Baker. In April 11, 1752, Mr. Henry Lemoyne signs his first receipt as curate, and continues to give receipts down to December 2, 1772, when he signs, "Henry Lemoyne, minister." He continues curate, however, throughout the rest of the book. From April 24, 1732, to April 11, 1753, Nicholas Mansfield was warden, and paid the salaries of the clergyman.

The earliest definite ministerial salary mentioned is that of £30, at which Mr. Hunt was paid in 1715–16. We have the income for the two years ending April, 1715, set forth as follows: Rd. Eavins and Wm. Earle being wardens—seats (that is for their allotment), 5s. 6d.; first year's subscription, £18 17s; second, £16 19s. 6d. Tithes—Mr. Davis, 2½ years, £1 17s. 6d; Mr. Delacomb, ditto for Colin's field, £1 5s.; Mr. Morrough, ditto for "Crimell pashig," £2; John Andrew, 2 years for "Mr. Wilyford ground," £3; John Andrew, 1½ years for Mr. Master's ground; Mr. Delacomb, 2½ years for his ground, 13s. 4d.; Mr. Jefford, ditto for his ground, 15s.; 2 years from Matthew Meddon, 12s.; Wm. Earle for his ground, £1. For breaking the ground—*i.e.* burials, £3; Reuben Dyer, £1 17s. 8d. "mencendunty book," ditto £1 5s. for 2½ year's tithes; ditto half year's subscription, 10s. Total, £57 2s. 10d.

In 1717 the "small tithes due yearly to the minister" are set forth as follows: Mr. Kirkeet, Matthew's meadow, 6s.; Widow Willyford, Martin's ground, £1; Mr. Jefford, ground behind his house, 10s.; "ditto for y^e pool park and y^e hill," £1; Earle, 8s.; Dyer, 20s.; Mrs. Morrough for Collins field, 10s.; Mrs. Davis, 15s.; Mrs. Susan De Lacomb for Tapson's ground, 13s. 4d.; Mrs. Morrough for passage-ground, 16s.; Mr. Jefford for mill field, 6s. Total, £6 16s. 4d.

The stipend was evidently fixed at £30 for some time. Mr. Alcock in 1732 signs for £7 10s. "for one quarter's subscription, tithes, and esqr Edgecombe's bounty;" but in the next year Mr. Bedford for £6 5s., exclusive of Mr. Edgecombe's bounty; and this continues the definite rate down to the date of Mr. Lemoyne's last entered receipt in December, 1772, the amount of the "Edgcombe bounty" not being stated. In 1724–5 Mr. Williams had the quarterly collections for the ministry—*i.e.* the subscriptions—given him quarterly, £4 11s. 5d. In 1713 there were 82 subscribers paying £18 17s., from 2s., up to 30s. for a "gallery."

No one matter occupies so much space in the book as the "setting of seats," which seems to have been the wardens' most important duty, and a matter of some revenue. Dr. Nichols and his wife paid 15s. in 1607; in 1624 there is the seating of "Mr. Rich Hall, Esq.;" in 1641 we find the name of the Plymouth merchant, Thomas Sherwill. In 1654 thirty-three seats were set, at prices varying from 6d. to 8s. each.

One remarkable feature of the book is that it gives no detail whatever of the joint occupation of the chapel by the Huguenot refugees of 1681–2 and the English inhabitants, which is stated to have led to much controversy until the former were provided with a special chapel of their own by the Edgcumbe family.[1] I am inclined to think that there must be some amount of exaggeration in the tradition. It is perfectly true that there is a long gap in the records betweeen 1672 and 1697, and that the existing French registers begin in 1692; but it is equally clear that the recorded services at St. George must have been in English; and it is very remarkable that so few distinctly French names should occur in connection with the chapel. These are all I have been able to find: "John the Frenchman" is named in 1698. In 1702 Mrs. Mounier pays 6s. 8d. for erecting a tombstone in the chapel-yard. 1713—Joan Delacomb, S. Louson. In 1756–7, among the seat-holders, occur the names of Delacomb and Gilliard. 1772, among the seat-holders are the names of Guillard, Delacomb, Gruzelier, and widow Fouraille. To these we may possibly add that of Jefford. The names of Peter Bellinger and Henry Lemoyne as ministers, though French, can hardly be reckoned in this connection.

We can gather from this volume several particulars regarding the old chapel removed in 1789 to give place to the present edifice. The building stood in a yard planted with trees, and was enclosed by a wall wherein were stiles, which had to be mended to keep the hogs out. It originally consisted of chancel, nave, and western bell-turret. There was a screen between the nave and chancel, which may be held to give colour to the suggestion that it was of Perpendicular date. About 1640 it was enlarged by the addition of a south transept, in which was the "lord's seat," next the nave. There were also eventually a west gallery, and two private side galleries; and the chapel could not have held more than 250 to 300 people at its utmost capacity. It does not say much for the congregation that in 1756, "twelve sacraments" are stated to cost "3s. 1d. each."

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[1] *Vide* "Parish and Vicars of St. Andrew, Plymouth." J. BROOKING ROWE, F.S.A., F.L.S. *Trans. Plym. Inst.* v. 89.

We pass to the secular antiquities, which are the most important relics of the past the township has to show.

Standing on the southern face of the headland next the Sound, three buildings are shown in the old map, apparently drawn as square structures, armed with cannon, and collectively called "the fortress of Stonehouse." One is placed at what is now called Eastern King; another at Devil's Point, and the third nearly midway, where there was once a little cove used as a landing place. Naturally the existing castle at Devil's Point; the tower used as a policeman's residence near the Winter Villa; and the remains at Eastern King, are at once suggested. There can be no doubt that the ruins at the latter point are part of one of these structures; and as little that the other two fall into the same category. Here, therefore, we have the "antiquities of Stonehouse." It is quite true that the Eastern King fort was really square, and that the Devil's Point tower is not; but we can hardly expect minute accuracy on all details. What is more to the point is that there is apparently an attempt to indicate an octagonal plan for the central building; and that this structure is embrasured, while the Devil's Point tower is plain—a very noteable distinction which exists between the present towers.

Any one who examines the Devil's Point and Winter Villa buildings can see that they are erected of precisely the same materials, and in the same style. The walls are of limestone in both, and the dressings of granite. The portholes are formed on one plan, of practically the same dimensions: and the entrance doorway is of the same character in each. They are clearly designed by the same head, and carried out by the same hands; and if their identification with the structures in the map is correct, instead of dating from the time of Elizabeth, as commonly suggested for the tower at the Point, they belong to the reign of Henry VIII., and are among the "blokehouses, castles, and platforms" he erected "upon divers frontiers of the Realme," guarding, in the two years 1537–39, every exposed spot along the coast by an earthwork, or a fort, or blockhouse; while larger works such as the castles at Pendennis and St. Mawes were completed a little later. Pendennis is not shown on the continuation of this map, and St. Mawes noted as half made. This would give the date of the drawing about 1542. It certainly was before 1553, for there is no note of the house at Mount Edgcumbe.

The builder of Pendennis and St. Mawes, and other local defences of this period, was Mr. Treffrye, of Fowey; and the Plymouth records show that there was considerable expenditure on the bulwarks of the town and on their armament at this same time. The walls of a corresponding building of the period were preserved by being worked into the sea-face of the Citadel outworks.

The Eastern King structure may be even older. Bulwarks along the water's edge were erected for the defence of Plymouth by the townsfolk at as early a date as we have any detailed record—the early years of the fifteenth century. The remains here show that the rock was cut away to form an internal platform, a ridge being left where the foundation of the wall came, whilst on the outside the reef was stepped. The entrance was on the west, through a doorway some four feet in width—one of the holes in which the bar was placed to secure the door remains. Immediately on the north of the doorway was the fireplace with its chimney—the latter being 2 feet 2 inches by 1 foot 9 inches. The opening of the fireplace is now three feet in width, and its height 8 feet 6 inches. So far as can be made out, the lower chamber was about 29 feet from east to west, and 22 feet from north to south. In the northern wall an arched opening, three feet wide, led to a flight of steps by which the upper platform of the tower was reached. A fragment of the vaulting here still remains. There are thirteen steps in the thickness of the wall, each 2 feet 6 inches broad, 10 inches deep, and 10 inches tread. This northern wall was built to a large extent against the country, and a capacious vault was excavated in the hill, and entered by an opening at the foot of the steps, which is now walled up. The opening into this vault was 4 feet 8 inches wide by 6 feet 8 inches high. There was a much smaller vault under the steps; but the opening—4 feet by 3 feet—is also walled up. The width of the walls varies considerably, from 5 feet 6 inches to 3 feet 9 inches. Limestone only is now to be seen in the building; and the rock platform was covered by a floor of rough concrete. The granite doorway was removed about a quarter of a century since by a marine named Morris, under the direction of Captain Wright, R.M., to the gun-drill battery at Long Room, where it still remains.

The tower at the Winter Villa is septangular, of very irregular plan. The two longer sides, the northern and the western, are at right angles; and the three seaward, or southern faces, are octangular in outline, or what would be octangular if the structure were symmetrical to correspond. Since the tower was built, the ground in the rear and on the west has been raised several feet. It is plain, not only from the old map, but from the nature of the locality, that there was a little creek landing-place on the west, which the building was evidently intended to some extent to protect.

The walls of the tower are of limestone, the dressings of granite, as in that at Devil's Point; but there is a kind of string course of slate immediately beneath the battlements. There are two floors, and the original entrance was through a massive granite doorway, deeply splayed, at the ground level, on the north. The modern entrance is by a recent doorway in the upper portion of the tower, on the existing ground level. The foundations are laid on the natural rock of the low cliff, which has been partially cut away for the purpose. The low battlements contain both embrasures and loops, the latter being composed of two pieces of granite, worked on the inner edges to give a round aperture.

Taking the seven faces in succession, sunways, we have:—1. The northern or landward face, containing the original door; two splayed and blocked square loops in the upper floor westward; and having three embrasures above with two loops alternating. 2. The north-eastern face, the narrowest of the series, containing the modern door, and the battlement having one embrasure and one loop. 3. The eastern face, containing one small square opening with granite dressings in the upper floor, a drain as if from an old garderobe, and having in its battlement one embrasure and one loop. 4. The south-eastern face, having one port-hole in the basement, with rebated dressings and holes for the hinges of the shutters, as in the tower at Devil's Point; in the upper floor a square opening as in No. 3; and above two embrasures. 5. The southern face, with a similar porthole in the basement, but a modern window in the upper floor replacing the old square opening, and with one embrasure over. 6. The south-western face, exactly like No. 5, in original character and present condition, except that the battlement has two embrasures instead of one. 7. The western face, with no opening except a loop at the southern corner of the upper floor, and with two embrasures and two loops in the battlement. It will be noted that the heavier ordnance were planted seaward, and that loopholes command the landward approaches.

The tower at Devil's Point is octagonal, but very irregular. The longest side, that next the land on the east, in which the doorway is placed, is fifteen feet in length; the opposite side thirteen. On the north there are three faces—one thirteen feet, and two of six feet each. On the south there are also three faces—two of eight feet and the middle one seven. The walls batter somewhat. There are two portholes, paired, in each of two seaward faces, west and southerly. They are formed with granite dressings, divided by a granite block, each being 2 ft. 4 in. by 1 ft. 9 in., and the blocks being rebated 3½ inches for shutters. The central block is 1 ft. 9 in. in width. The doorway is also formed with granite dressings, and has a low-pointed arch, the head of which is six feet from the top of the wall. The structure originally consisted of one chamber, with vaulted roof, and its purpose was evidently to guard the passage into the Hamoaze, and not to afford quarters for anything like a garrison.

So late as the early part of the last century Stonehouse appears to have consisted of only four streets, which met at the quay. These were Passage, now Newport Street, Chapel Street, a narrow street which has been widened into Edgcumbe Street, and High Street. The ferry from Dock ran nearly at right angles to the present bridge into Passage Street, where there was a break in the line of buildings next the water at the landing-place. The whole town did not consist of 150 houses; but this was, of course, before it had been selected as the site of any government establishments. The first of these to be erected was the Royal Naval Hospital, in 1762, followed by the Marine Barracks, in 1795, and the Victualling Office, in 1825.

There are several points in the more recent history of Stonehouse that invite attention; but this paper deals only with its early times. Otherwise we might enlarge upon its interesting

Huguenot associations; or we might recall the days when for a while the town assumed the character of a fashionable watering-place—when the Longroom was built, and the grounds about it laid out in gardens, walks, and bowling-greens, overlooking not only the Sound, but what was then the quiet tree-girdled inlet of Millbay; when the assemblies of the neighbourhood were held there, and "society," drawn thither by these attractions, made the township its resort. But these are matters of comparatively modern experience, and we have been dealing with the "restitution of decayed intelligence concerning antiquity."

APPENDIX.

The following extract from the *Edinburgh Magazine and Review* of June, 1776, is at once so scarce and interesting that it is here cited by way of appendix:

"*An account of a* Subterranean Cavern *lately discovered at* Stonehouse, *near* Plymouth.

"*To the Right Honourable Lord* Edgecumbe.

"My Lord,

"*Plymouth Dock, March* 1, 1776.

"I HAVE the honour of communicating to your Lordship an account, which I took on the spot, of a subterranean cavern, lately discovered in your Lordship's demesne at Stonehouse. The place, at a considerable extent round, as your Lordship well knows, belonged formerly to the Monks. Part of the wall that enclosed their garden is still to be seen [This is an error; the wall is that of the house of the Durnfords]. The cavern was accidentally discovered by some miners in blowing up a contiguous rock of marble. The aperture, disclosed by the explosion, was about four feet in diameter, and looked not unlike a hole bored with an auger. It was covered with a broad flat stone, cemented with lime and sand; and twelve feet above it, the ground seemed to have been made with rubbish brought thither, for what purpose I know not, unless it were for that of concealment. Here indeed, but here only, we saw some appearance of art, and vestige of masonry. The hill itself, at the northern side of which this vault was found, consists for the most part of lime-stone, or rather marble.

"From the mouth of this cave (through which we descended by a ladder) to the first base, or landing-place, is twenty-six feet. At this base is an opening, bearing N.W. by W., to which we have given the name of Tent Cave. It resembles a tent at its base and in its circumference, and stretches upwards, somewhat pyramidically, to an invisible point. It is, as far as we can measure, about ten feet high, seven broad, twenty-two long: Though there is an opening, which, on account of its narrowness, we could not well examine, and in all probability it has a dangerous flexure. In each side of this Tent Cave is a cleft; the right runs horizontally inwards ten feet, the left measures six by four. The sides of the cave are everywhere deeply and uncouthly indented, and here and there strengthened with ribs, naturally formed, which, placed at a due distance from each other, give some idea of fluted pillars in old churches.

"In a direct line from this cave to the opposite point is a road thirty feet long. The descent is steep and rugged, either from stones thrown into it from above, since the discovery, or from fragments that have fallen off at different times, from different places below. This road is very strongly but rudely arched over, and many holes on both sides are to be seen, but, being very narrow, do not admit of remote inspection or critical scrutiny. Having scrambled down this deep descent, we arrive at a natural arch of Gothic-like structure, which is four feet from side to side, and six feet high. Here some petrifactions are seen depending. On the right of this arch is an opening like a funnel, into which a slender person might creep ; on the left is another correspondent funnel, the course of which is oblique, and the end unknown.

"Beyond this Gothic pile is a large space, to which the arch is an entrance. This space or inner room, (for so we have termed it) is eleven feet long, ten broad, twenty-five high. Its sides have many large excavations, and here two columns, which seem to be a mass of petrifactions, project considerably. On the surface of these pillars below, are seen some fantastic protuberances, and on the hanging roofs above, some crystal drops that have been petrified in their progress. Between those columns is a chasm capable of containing three or four men.

"Returning from this room, we perceived on the left an avenue thirty feet long, naturally floored with clay, and vaulted with stone. It bears S.S.W., and before we have crept through it, we see a passage of difficult access and dangerous investigation. It runs forward twenty-five feet, and opens over the vault thirty feet high near the largest well. Opposite to this passage are two caverns, both on the right hand. The first bears N.W. by W., and running forward in a straight line about twenty feet forms a curve that verges somewhat N.E. Here we walk and creep in a winding course from cell to cell till we are stopped by a well of water, the breadth and depth of which are as yet not fully known. This winding cavern is three feet wide, some parts five feet high, in some eight. Returning to the avenue we find, adjoining to this cavern, but separated by a large and massy partition of stone, the second cavern running west ; and by descending down some small piles of lime-stone or rather broken rocks, the bottom here being shelvy slate, or more properly a combination of slate and lime-stone, we discover another well of water. This is the largest. The depth of it is in one place twenty-three feet, the width uncertain. Opposite to this well, on the left hand, by mounting over a small ridge of rocks covered with wet and slippery clay we enter a vault eight feet broad, eighteen long, thirty high. Here, towards the S.E., a road, not easy of ascent, runs upwards of seventy-two feet towards the surface of the earth, and so near to it that the sound of the voice, or of a mallet within, might be distinctly heard without: In consequence of which, a very large opening has been made into it. At the bottom of this vault, in a place not readily observed, is another well of water, the depth of which, on account of its situation, cannot be well fathomed, nor the breadth of it ascertained.

"While the miners were exploring those gloomy and grotesque regions, they were alarmed at a murmuring sound that seemed to come from the hollows of the cave; and one of them, who chanced to be near the largest well with a candle in his hand, saw at that instant the water rise about half a foot. This phenomenon then could not be explained. But now we think that the several wells are nearly on a level, and that the waters shape their course towards the sea, and mix with it in Mill Bay, at the distance of four hundred and twelve feet. It is not certain whether those wells, though they lie below the extremity of the limestone, have a mutual communication or not; but it is highly probable, as the bottom of the largest well is clay, and its sides are shelvy slate, that there are springs; and it is certain that this shelvy vein of slate, nearly of the same kind and colour with some seen at Mount Edgecumbe, on the opposite shore, is continued even to the sea, where two openings at low water have been found, through which it is probable the water of the great well discharges itself. When the tide rises, it is presumed that the pressure of the sea without retards the course of the water within; and this may account for the rise and fall so manifest at different times of sounding: And the same circumstance is observed also in a well near the old French prison, in the environs of Plymouth.

"Each cavern has its arch; each arch is strong, and in general curious. The way to the largest well is, in one part, roofed with solid and smooth stone, not unlike the arch of an oven. No one seemed to be affected by the damps till he came hither, and then the candles grew dim, and one of the investigators, as well as myself, felt unusual and uneasy sensations. However, since an opening has been made near the arch of the great wall [*sic*], and the air has had a much freer access, no such symptoms have been perceived. It is very likely that the hill itself is hollow; some of the caverns have reciprocal communications; but the clefts are often too narrow for accurate inspection or minute inquiry. The water here and there is still dripping, and incrustations, usual in such grottos, coat the surface of the walls in some places. There are some whimsical likenesses, which the pen need not describe, nor the pencil delineate. Mr. Cookworthy of Plymouth, a very ingenious man, and an excellent chymist, has been so obliging as to analize the water of the three wells, and has found, by many experiments, that it is very soft, and fit for every purpose.

"I therefore beg leave to congratulate your Lordship on the discovery of this water, which, though there was no want before, cannot fail to be a valuable acquisition to your town of Stonehouse; a place very delightful, and superior to most for the beauty of its prospects, and the elegancy of its situation, and, what is still better, for the goodness of the air; as the longevity of the inhabitants sufficiently evinces.

"I have the honour to be, my Lord, your Lordship's most obedient and obliged humble servant,

"FRANCIS GEACH."

SOME POPULAR SONG WRITERS OF IRELAND.

SYLLABUS OF PAPER BY THE REV. J. ERSKINE RISK, M.A.

(Read 18th November, 1887.)

THE officer, Wood, and his *nom de plume*, "Lanner de Waltram;" "The Spalpeen," Milliken, Bennett, and Toleken; Ned Lysaght; Callănan; Father Prout; the Right Hon. Arthur Ogle. Dr. MacDonnell and his flight from Limerick. Change in later Irish songs, and the cause; Sir Samuel Ferguson; Clarence Morgan; Thomas Davis; Dr. Ingram. Irish new nationality. French estimate of Irish Ballads and Poetry.

TRAWLING.

BY BENJAMIN J. RIDGE.

(Read November 25th, 1886.)

THE early history of Trawling is somewhat obscure. Historians and chroniclers have given abundant reliable information about the Drift Net Fishing, as it relates to Herring, Pilchard, and Mackerel; to the use of the Seine Net for both Mackerel and Pilchard; and also on what is curiously termed Trawling for Herring in the lochs of Scotland, which is properly an adaptation of the Seine Net; and there is much to be found, written by one and another, concerning the use of hand-lines (hook and line fishing). But there does not appear to be any very clear or reliable account as regards Trawling, which differs very widely from any of the methods already mentioned, both as to the net used, and the fish to be caught, and the seas to get the fish from. It is generally considered to have been first practised in our own country about a hundred and fifty years ago.

Froude indeed, in his *History of England*,[1] speaks incidentally of trawlers at Brixham so long ago as the time of the Spanish Armada, in the description of the English attack on the Spanish fleet; "Drake, returning from the chase, came up with her [the *Capitana*, the admiral's disabled ship] in the morning. She struck her flag, and he took her with him to Torbay, where he left her to the care of Brixham fishermen. The prize proved of unexpected value; many casks of reals were found in her, and, infinitely more important, some tons of gunpowder, with which the *Roebuck*, the swiftest trawler in the harbour, flew in pursuit of the fleet." But as the *Roebuck* is also mentioned as being an armoured vessel, it is rather doubtful whether she was a trawler.

It is generally held that Trawling began by our Devonshire fishermen about a hundred and fifty years ago; and that they were the first to practice it in this country, and became the pioneers of this kind of fishing in all the principal fishing ports of England; viz., Ramsgate, Lowestoft, Great Yarmouth, Grimsby, Hull, Scarborough, and most probably at Barking also. In its earliest days the net was comparatively small, and the craft on board which it was used not more than twenty to twenty-five tons burden. For many years very little increase took place, either in the size of the boat or net, or yet in the number of boats engaged in this particular fishery, probably owing to the fact that fishing by this method was not prosecuted very far from land, but in the bays and inshores of our coast. And as the consumption of fish was not so proportionately great as at present, and the supply always equal to the demand, there was no very great enterprise called forth for any alteration in the general method, or the size of net or craft. So matters went on in a very orthodox fashion, and very little change or improvement was thought of. But when innovations were suggested, and circumstances demanded more enterprise, the old order of things soon gave way to many improvements in both the vessels and appliances, and a very great increase in Trawling generally was the result.

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[1] Vol. xii. p. 397, cabinet edition, 1870.

The Trawl Net is of peculiar construction, consisting of four distinct parts; viz., back, battings, wings, and belly. The lower part again is called cod-end, or bag.

First, the back proper is a square piece of net, of 200 to 250 meshes broad, of four inches from knot to knot, and forty to fifty feet deep, according to the size of the craft on board of which it is worked.

Second, the battings is commenced at the lower end of the back or square, and by decreasing the number of meshes, by a very simple way of taking two meshes into one at the beginning of every third round. Decreasing in this way regularly till it is brought down to, say, fifty meshes square, finishes the battings; and then, by continuing to, say some eight feet, it makes one point of the cod-end.

Third, the belly is constructed very similarly to the battings.

But the wings are altogether different in construction, and partly form the bosom of the trawl, and are an essential part of the net.

The head of the wings forms the bosom, and is commenced close to the head of the belly. It is begun, say, by forming 180 meshes square, and after a few rounds are made is divided in two equal parts of sixty meshes each, one sixty being for the bosom proper, and the rest for the wings; and by continuing to drop one mesh at the side of each round, forming what is termed a flying mesh, to which in turn is attached a line, called the bolet-line; to this is afterwards fastened the ground-rope.

The several parts of the trawl net being thus made, it is laced together by the sides (or selvedge), and this forms the bag, containing pockets. These pockets, constructed by simply interlacing a portion of the bag at its lower part together by the side, form a funnel, through which the fish are caused to pass by the net being towed through the water at the bottom of the ocean. This finally finds the fish at the cod-end, which is secured by a strong piece of rope, drawn together just as a bag-purse.

The net is then securely fastened to the trawl beam, made of oak or beech or elm, from thirty-eight to fifty feet long, of twenty-one inches in circumference, to both ends of which is attached the trawl iron, on heads weighing from 200 to 500 lbs., according to the size of the craft, &c.

To the heads are fastened the spar or bridle, this in turn being fastened by strong shackles to the trawl warp, for towing the net along when fishing, which completes the gear.

I must ask those of you who have been fortunate enough to have gone out in Mr. Watson's *Lola*, and seen the *modus operandi*, to permit me to explain to those here this evening who have not been so favoured, how Trawling is done. We must imagine, then, we are sailing to the fishing-ground with a fine spanking breeze, and that we are really at the desired spot. The skipper stands at the helm, the gear is quite ready for putting over, and the skipper shouts, "Pay away the trawl!" Over it goes in the sea, and the word of command is given, "Let go forward." Away the fore part of the beam and head goes with a crash and splash, until it comes square across the stern of our smack; and then the last word is given, "Let go abaft," and all of a sudden trawl and trawl beam go sinking to the bottom, attached to the warp; and when sufficiently astern, some 180 fathoms, the warp is secured, and towing the net along is the order both of the day and night, until the haul is finished, and in due course the net is got on board with its contents.

The process of raising the vast cod-end to the boat's side is no easy matter, requiring considerable manual strength and tact, especially on account of the tide and sea and wind. This is not very plain to the uninitiated, and as I am not anxious to make you expert trawlers, I will spare you this part of the trawler's art. In the days of our oldest trawlers the only means of raising their gear was the obsolete stick-winch—superseded by the cog-wheel winch and capstan, and now being rapidly outdone by steam power.

But it is fish the trawler wants; and where to get it, and when best to get it, is of course after all the great thing, and especially what sort is worth getting, and how best to make the calling profitable.

In former days the hake was of great importance, because of its numbers, its being most wholesome food, and being found close to our shores. Soles, plaice, and kindred kinds of flat-fish were also in fair quantities; and as Trawling was chiefly confined to our western shores, and there was a falling off now and again from perfectly natural causes, it was necessary that other fishing grounds not very much explored should be tried. So as time went on, and the spirit of enterprise was not entirely extinct in our Devonshire men, eventually the North Sea became the field of operations for some three months of the year—the celebrated "Silver Pits" having more attraction than any other place, chiefly because enormous quantities of soles were caught there, which were then, as now, in great demand, and always fetched high prices in London, especially during Lent.

This enterprise on the part of our Devonshire men resulted in many of them and their families settling at Ramsgate, Hull, Grimsby, and Lowestoft, which ports to-day, with Great Yarmouth and Scarborough, are the principal fishing stations for Trawling purposes in Great Britain; and the development at each port would require a special paper to fully describe it.

But at this point it will be interesting if I give the case of Great Grimsby.

About thirty years ago there were three smacks fishing out of that port. Hull at that time being fairly well established, many smacks were hailing thence, and a regular fishing trade was being carried on there (already established by Devonshire men), especially as the dock accommodation was equal to the requirements of the fishing.

But it occurred to some among them that Grimsby being many miles nearer the mouth of the Humber, and correspondingly nearer the fishing grounds; and also in touch with London equal to Hull, with many other natural advantages—it was just possible it would be to their advantage to settle there. Accordingly they did so, well knowing that the buyers would follow.

It is somewhat significant about Grimsby, that the late Prince Consort, in laying the foundation-stone of the Royal Dock at this port, made use of the following almost prophetic speech:

"We have been laying the foundation-stone of a dock, not only as a place of refuge and refitment for our mercantile marine, and calculated to receive the greatest steamers of H.M. navy, but I trust it will be the foundation of a commercial port. This work in future ages, when we shall long have quitted this scene, and when perhaps our names will be forgotten, will, I hope, become the centre of life with the vast and ever-increasing commerce of the world."

In a great measure this prophecy has been fulfilled, for at least its fishing trade has outgrown the most sanguine expectation. Grimsby stands far ahead of its compeers in this important industry. It is a wonder of commercial enterprise, giving employment to no less than 5000 men and boys; and assuming that 1,500 of the men are married, with families of say three children on an average, we have 10,000 people directly obtaining their living from its fishery.

And when we consider for a moment that not long after this event there were very few vessels fishing at this port of from thirty to forty tons register, whereas to-day there are nearly eight hundred sailing trawling vessels of from fifty to ninety tons register, it will be admitted that there is scarcely anything equal to it in the history of the fishery of this or any other country. Now steam vessels are being introduced into the business, and though they are more expensive in their cost and working, yet they are proving successful in some instances, and likely to become serious competitors against the sailing trawler. From this it will be seen that to meet the requirements of so large a fleet special dock accommodation is necessary. The present docks and pontoons devoted to the business are as follows: Old dock area, 12 acres, 20 feet water on the sill, H.W.O.S.T; new fish dock, area 11 acres, 20 feet water on sill, H.W.O.S.T.; and at present even these two docks are not large enough to completely grapple with the growing needs of this fishing industry.

The fish-market, where the business is done of selling the fish by wholesale, is said to be the largest in the world. It is 885 yards long (rather more than half a mile), and not less than 1000 people find constant employment there, while the scene on any day beggars description. Some idea may be gathered of the trade done in fish at this port by the following figures:

1875.	35,929 tons sent away by rail.	
1885.	68,855 ,,	,,

Increase of 32,925 tons, or 90 per cent.

But the above figures do not give the whole of the fish caught by Great Grimsby trawlers; for there is a constant traffic going on from the fleets to London.

The experience of other ports is equally interesting, and a few facts in connection with Great Yarmouth will also be of note, as showing how the circumstances and necessities of certain times act and re-act on the welfare of places.

The year 1840 witnessed the first trawling vessel built belonging to that port, for a certain Mr. Lincoln, who kept the "Feathers Inn." The smack was named the *John Bull;* and at that time our Torbay men fishing in the North Sea occasionally put into Great Yarmouth, and sold their fish there, and, strange to say, it was generally sold in the "Feathers Inn" yard; so I have no doubt but that this Mr. Lincoln, seeing what fine catches the Torbay men were bringing in from time to time of soles, plaice, turbots, brill, haddocks, &c., was prompted to enter into this good thing, and not let our men have it all their own way, and hence had the *John Bull* built, which began the trawling fishing of the port. In those days fish was posted from Yarmouth to London by coach; and as it often happened that head winds prevented trawlers fishing in the Silver Pits from getting to Billingsgate (London) with their week's fishing in a first-class condition, they used to put into Yarmouth to catch a market.

From that single vessel in 1840, the number had increased to sixty-five in 1853, and to-day there are no less than 654 vessels sailing from Yarmouth engaged in this important industry, employing at least 2,024 men and boys; and nearly the whole of their fish is taken to Billingsgate for sale.

It is well to note here a curious incident, as showing the enterprising spirit by which this important fishery has been carried on. Some thirty years ago a considerable number of trawling vessels belonged to Barking, and they were partly owned by Messrs. Hewitt and Co., of London, fish salesmen, who, seeing the advantages Great Yarmouth offered for working the North Sea, determined to shift all their craft to that port: this necessitated the fishermen and their families moving to that place also; and soon Barking, as a trawling fishing town, became extinct.

Lowestoft in turn began to be seized upon by Devonshire men, who had previously settled at Ramsgate; and, going back not more than thirty years, an increase from some half-dozen smacks then to two hundred to-day has taken place, and is still proceeding at a satisfactory rate.

Not only in number of boats has this improvement gone on, but in size, in construction, in speed, and in sea-going qualities there has been a marked improvement, and the fleets from Scarborough, Hull, Great Grimsby, Great Yarmouth, Lowestoft, and Ramsgate, are supplemented by a respectable contingent yearly from Brixham of some sixty craft. The North Sea is the scene of their daily and nightly operations, reaping the rich harvest of its depths as food for the people, the supply of which does not appear to be materially affected by the increasing demand upon its fruitfulness. And when we think for a moment that not less than 2000 British trawling vessels are constantly fishing the North Sea, it is not too much to expect that the State should be ready to assist this important industry by wise and practical legislation, assisted by practical men, instead, as is too often the case, by mere departmental officials, who, to use a fisherman's way of putting it, don't know a hake from a herring. Up to the present the State has done little or nothing to help the development of this vast industry; in fact, it has been almost entirely ignorant of its growth and importance to the country, and has only very recently taken any steps to understand its duty.

I have so far given you some faint idea of the growth of Trawling in the North, which is the principal locality of this fishery; but it must also be mentioned, in passing, that at Fleetwood and Tenby there is also this kind of fishing going on, though not of such importance as in the places already mentioned.

The method of prosecuting the fishery is somewhat different generally in the North to what it is with us in the West, owing to the great distance from land they have to go to find fish; whilst we get ours comparatively close to the shore.

In former days, after getting a fair catch, the Grimsby, Hull, Ramsgate, and Yarmouth men would come to land and make for the nearest possible port, according to wind, &c., and this would cause them to lose much time, till at last mutual interest led them to form themselves into small fleets, when each in turn would go to market with the result of the twenty-four hours' catch of the whole fleet; so that a fresh supply was maintained at market daily. Each crew would pack their fish in baskets, termed *pots*, and put them on board the craft whose turn it was to go to market, and they would be labelled for the fish salesman at Billingsgate, or other market, employed to sell the respective consignments. This plan of fishing in fleets in course of time became almost universal, especially at Hull and Yarmouth the whole year through, and at the other ports in summer months. The fastest among the fleet were generally engaged for this carrying purpose, and received payment at per package for their work.

From sailing cutters as carriers it became necessary to employ steam vessels; and this is now the general method for bringing the fish to market, which ensures a regular and quick transit from the various fleets to London or elsewhere, as desired.

Each fleet is under the charge of an Admiral, who determines the proceedings of his followers by signal, using flags by day and rockets by night; and generally he has from twenty to seventy, and sometimes as many as one hundred and fifty, vessels fishing together under his personal direction; so that a uniform system is going on every day in the year, and every night as well, among the greater number of our trawlers in the North Sea; and at daybreak it is a sight to see a fleet of trawlers getting their gear on board, and preparing their catch for the carrier, which has been waiting all night in their midst to attend to them in due course. The carrying of the night catch in the small boat from the smack to the carrier constitutes a great source of danger, especially in winter time, when it blows heavily. Many lives have been lost in thus boarding the carriers, and considerable discontent is caused among the fishermen, that they are forced to continue this practice in winter time. The Grimsby men particularly object to this fleeting system, not only on account of the risk to life in boarding the carrier, but also that it keeps them out at sea from six to eight weeks at a time, without returning to their homes, whereas those who fish single-boating, carrying ice for preserving their fish, do not stay longer than five or six days at sea before returning to market. In summer time no doubt fleeting is unavoidable; fishing as they do so far away from any market, that, with the usual calms prevailing, unless steam carriers took the fish to land daily, it could not reach market in the fresh condition which it now does.

Fishermen formerly sold their own fish, and on arriving at the fish-wharf or quay, buyers, who would be on the look-out, would salute the skipper in some such way as this, "What have ye got?" and according to the particular mood the skipper was in, determined very much upon the success of the trip, he would answer. "Well, what do you want for your hakes?" "What are you giving?" "I'll give you six shillings per dozen. Shall I have them?" "How much do you say?" "Why six shillings." And this bartering went on till a bargain was struck, and the sale so finished at some fixed price.

Now all this is altered. In fact, in any important fishing port in England fish salesmen sell the fish by auction, and pay the amount of sale, less commission, holding themselves responsible to the fishermen for the amount so sold, which system you can see carried on any day on the Barbican.

In some places sales are conducted on the old system of Dutch auction; that is, by asking a price for a given lot, say of £1, and then by lessening the price 1s. a time, commonly called a lower, when some buyer shout out *pit*, meaning that he will take it at the price last named. Such a method is practised at Lowestoft, Ramsgate, Great Grimsby, Hull, and it is a very interesting sight to witness the sale going on, as it is done, in all manner of tones of voices, many salesmen shouting at the same time, some selling soles, others turbots, some plaice, and in turn others haddocks; and to a stranger it certainly must appear much more like discord than harmony.

At other ports sales are conducted on the auction principle, until the highest bidder becomes the purchaser, which is the style we practice in Plymouth.

The difficulty surrounding the fishing interest at present is not so much one of catching as it is one of distribution. Without going into the question of supply, whether it is increasing or decreasing, I may perhaps just mention the report of the Commissioners appointed to inquire and report upon the complaints that have been made by Line and Drift Net fishermen, of injuries sustained by them in their calling, owing to the use of the Trawl Net and Beam Trawl in the territorial waters of the United Kingdom (1885)—after having held sittings in London, Aberdeen, St. Andrews, Edinburgh, Dunbar, Berwick, Sunderland, Scarborough, Hull, and Brixham, and examined witnesses from Golspie, Peterhead, Port Errol, Whinnyfold, Newburgh, Fortdee, Aberdeen, Torry, Burabanks, Cove Findia, Porthethen, Downie, Stonehaven, Johnshaven, Broughty Ferry, St. Andrews, Cellardyke, Anstruther, Pittenween, St. Mananca, Backhaven, Leith, Edinburgh, Newhaven, Granton, Preston Pans, Cockenzie, North Berwick, Dunbar, Codlingham, Lynmouth, Bournemouth, Berwick-on-Tweed, North Shields, South Shields, Whitehaven, Sunderland, Hartlepool, Staithes, Whitby, Scarborough, Filey, Hull, Great Grimsby, Great Yarmouth, Lowestoft, London, and Brixham (in all forty-nine fishing ports), which ought to satisfy any reasonable Britisher, if a commission of inquiry is of any use at all. They gave the following conclusions:

I. In territorial waters from Moray Firth to Grimsby.

(*a*.) A falling off of flatfish.

(*b*.) A decrease of haddock in certain places.

II. In off-shore waters. No decrease in the total take of fish in the North Sea, except in the case of *soles*.

III. The beam trawl is not destructive to cod and haddock spawn. There is no proof of injury to the spawn of herrings or other edible fish.

IV. There is no wasteful or unnecessary destruction of immature food fishes by the beam trawl.

V. The number of fish on particular grounds, especially in narrow waters, may be sensibly diminished by the use of the beam trawl.

VI. The injury done by the beam trawl to the food of fishes is insignificant.

VII. It has not been proved that the use of the beam trawl is the sole cause of the diminution of fish in territorial waters.

VIII. In the absence of a proper system of fishing statistics and scientific observation, it is impossible to discover the causes or measure the fluctuation of the fisheries.

Therefore from the foregoing it is evident that generally there is no serious falling off in the supply. It is rather the distribution which is at present the subject demanding consideration; for it is one thing to collect the "riches of the deep," but another getting them into the towns and villages in all haste and good condition, and at little cost, that the people may have a meal of fresh, good fish at a reasonable price, and yet leave a fair margin of profit for the fisherman. It cannot be denied but that the railway has opened up many advantages for fish being distributed in all directions, and where there are competing lines many facilities are offered to get the traffic in Neptune's host. Yet it is well known that the cost is out of all proportion to the worth of the fish carried. In hundreds of instances the proceeds of the fish are swallowed up by the payment of railway carriage, and nothing, or very little, left for the sender, which of course comes back upon the catcher, as well as affecting the public, as it checks enterprise, and is virtually a tax on the food of the people. I will quote one case as showing the extent of the inequality in rates. For carriage of a truck of salted herrings from Scarborough to Yarmouth weighing 7 tons, £12 8s. 10d. was charged; whereas if the same truck with 7 tons of coals was sent from a colliery in Wales to Yarmouth £2 10s. 3d. would only be demanded. It is this unreasonable excessive charge on transit of fish that is doing vast injury to the producer and consumer. When considered from the point of view of a food question it is anything but creditable or patriotic, and must sooner or later become a matter for serious consideration by any British Government worthy of the name. Before leaving this part of the question I only wish to say that I have seen hundreds of tons of most wholesome fish sold for manure when there has been a heavy fishing, simply because the railway charges were more than the fish would realize at inland towns; whereas if the rates were fifty per cent. less than at present the difference would have enabled senders to have forwarded the quantities mentioned, and thereby would have been a source of revenue to the railway companies, as well as securing a greater supply of wholesome food to the people, and benefiting the fishermen in a corresponding degree.

Going back to the early days of Trawling, it must be noticed that it was the custom to fish from Monday to Saturday, coming to market every day or two, according to circumstances, and after thus fishing the week to spend the Sunday at home with wife and family, beginning afresh on Monday morning. This is the custom prevailing, and likely to continue, among our own men at Plymouth and Brixham, and the method, it must be admitted, has had beneficial moral effects upon the men and their families, the Sabbath rest at home sweetening life's toils in no unmistakeable manner.

The system of fishing in fleets, keeping the men at sea eight weeks at a time, which is the general system in the North, though many only stay out from one week to a fortnight when fishing single-boating, naturally deprives them from the advantage of being among their families so often as is enjoyed by our local fishermen; add to this, that during winter time they are overtaken by severe gales, with no opportunity of running to harbour for shelter, but have to face it out at all hazards. You will agree with me, I am sure, that it is at no little privation, risk, and danger, that our trawlers are obtaining the food supply which is so important to this country, and that their life is by no means an enviable one. Not a winter passes but some fisherman's home has its bread-winner taken from it. I know of no fishing port where so many fishermen's fatherless children are to be found as at Hull or Grimsby; and it is satisfactory to know that at present some hundred children are being maintained from the fund created by a portion of the balance from the profits of the late International Fishery Exhibition. £10,000 was handed over for this purpose.

And there is another danger which our trawlers in the North have been seriously troubled with, but which is happily becoming less year by year. The curse of the North Sea has been the Dutch "cooper," or floating grog-ship, which used to be constantly cruising among the various fleets, and selling tobacco and the vilest kinds of spirits. This traffic increased to so great an extent that it became a moral pest, and was working serious consequences, which had at last to be taken into consideration by the British, Dutch, and Belgian governments. A convention was entered into for its repression; but it remained almost a dead letter, and did very little in stopping this traffic. The Mission to Deep-sea Fishermen has, however, nearly cleared the sea of this illicit liquor traffic, besides being a very successful agency for the improvement of the moral and spiritual condition of our trawlers there, furnishing them with books to wile away the weary hours and days and weeks, also affording them relief in sickness and injury, and cheering and brightening the dullness and monotony of their lives by its presence and ministry.

The work is carried on by the aid of seven vessels, of similar build to the trawling vessels, six of which are constantly with the fleets (that is to say, one to each fleet); and whilst each fishes as a regular trawler, it is also devoted to mission-work. As often as possible religious and temperance services are held on board these vessels (the men themselves being their own parsons), which are of a very hearty kind, and helping each other to make the best of life; for with them "life is real, life is earnest," and much good has resulted from the work thus carried on.

Each vessel has a supply of medical stores, and the masters have had some training in dressing wounds and binding up fractured limbs. Much philanthropic work has been done in this way; and, what is also of common-sense benefit, the vessels supply the smacksmen with cheap tobacco, that they may have no reason to visit the grog-shops.

But it is a very curious fact to note, that our Revenue authorities will not allow tobacco to be supplied out of bond for our trawlers in connection with this particular work. Hence the Mission gets its tobacco sent from Leicester to Ostend, where one of the vessels goes for it. It is delivered to them through the Belgian Custom authorities; and after all this is done, sold to our trawlers for one shilling per pound the shag, and one shilling and fourpence the hard tobacco.

This Mission was founded as a separate institution in 1884, by the Rev. E. J. Mather, who is also the director; and for mission-work to fishermen is one of the most successful religious and temperance movements of these times of special missions.

The office of the director is Bridge House, 181, Queen Victoria Street, London, E.C.; and if any lady or gentleman should wish to know more of the work or assist its operations, I am sure Mr. Mather would welcome your enquiry or cheque.

LEIBNITZ.

SYLLABUS OF PAPER BY THE REV. PROFESSOR CHAPMAN, LL.D.

(Read 2nd December, 1887.)

His early days and great achievements in learning. His university career. His entrance on public life at Mayence and Hanover. His travels in Italy in search of materials of history. His visit to Paris and scheme for the French conquest of Egypt. His acquaintance with Newton and the Royal Society of London. The controversy respecting Newton's discovery of the differential calculus. The main principle of his philosophy. His doctrine of monads. What men, beasts, and all other things are. Pre-established harmony. The relation of Pope to his optimism. His views on the law of continuity. Conservation of energy. His anticipation of Darwin. His scheme for a universal language. General estimate of his position as a leader of thought.

THE ORIGIN AND DEVELOPMENT OF THE RAILWAY SYSTEM IN ENGLAND.

SYLLABUS OF PAPER BY E. NICOLLS.

(Read 9th December, 1887.)

Ancient roads, Macadam. Rails for mines and quarries. Steam power. First attempts to construct locomotive. Trevithick, the Cornishman. First railway. Difficulties from landowners. Mobs and Parliament. Rapacity of a Cornish landowner. The second railway. The battle of the gauges. Stephenson and Brunel. Failure of the Atmospheric. Formation and growth of companies. Gradual growth. Magnitude of undertakings. Railways as an investment. Do they pay? Railway legislation. The clearing house. Effect on places. Not an unmixed good. Great railway men and works. The motive power of the future: Electricity or Steam? Safety of railway travelling. Railways necessary to civilization and commerce. Up to the present a magnificent boon. What of the future? Conclusion.

RECENT PROPOSED MODIFICATIONS OF THE DARWINIAN THEORY.

ABSTRACT OF PAPER BY WALTER HEAPE, M.A.

(Read 16th December, 1887.)

THE lecturer prefaced his remarks by reminding the meeting that —(1) Darwin did not evolve the theory of evolution, but that he sought to explain, by means of his theory of natural selection, the origin of one species from another species; (2) that a belief in Darwin's theory does not entail a belief in the occurrence either in the living or fossil state of species intermediate with any two *existing* species, but it rather entails a belief in the occurrence of species, or varieties of species, either living or dead, which are intermediate between two or more species and their common ancestor.

The evidence which Darwin brings forward in favour of his theory was then shown to demonstrate—

1. The tendency in all living things to vary.
2. The tendency in all living things to inherit the peculiarities of their ancestors.
3. The power of living things to adapt themselves to circumstances.
4. The struggle for existence; natural selection, sexual selection.

The views of Mr. Frank Dixon, as stated in his book, *Evolution without Natural Selection,* were then discussed; viz., The influence of

1. Isolation.
2. Climate.
3. The use and disuse of organs.
4. Sexual selection.
5. Interbreeding and crossing.

It was pointed out that Darwin's views were not only not opposed to Dixon's theories, but that the latter were included in the former; and the fact elucidated that Dixon only differed from

Darwin in assigning a greater importance to the influence of isolation upon the origin of species.

The fact that the occurrence of violent and sudden changes in the physical aspect of the world is necessary, in order to account for the great influence Dixon considers isolation has had in originating species, was urged to be a fatal objection to the theory, and Darwin's statement, that "natural selection has been the main but not the exclusive means of modification," was considered to be the most correct expression of our present knowledge of the subject.

The lecturer then passed on to consider Mr. Romanes' paper (Linnean Soc., May, 1886) on "Physiological Selection, an Additional Suggestion on the Origin of Species."

Mr. Romanes' statement, that natural selection is not a theory of the origin of species at all, but a theory of the cumulative development of adaptation, was considered, and the fact pointed out that natural selection does not originate the variations which constitute a species, and is not therefore the cause, in that sense, of their origin; but that it consolidates certain of the innumerable variations, which are brought about by various agencies, renders them of imperative necessity, and by this means forms a species.

Romanes was shown to maintain that "the principle of the prevention of intercrossing with parent forms, or the evolution of species by independent variation" is the most important influence in the formation of species; and that on account of (1) the very general occurrence of sterility between closely allied species, and (2) the fact that closely allied species are not always separated by geographical barriers, he does not consider isolation a sufficient reason to account for the phenomenon, and suggests an additional factor in the formation of species, and calls that factor "Physiological selection." He urges that by means of it species are formed from varieties, which would otherwise be absorbed, and that it is only by the help of physiological selection that natural selection can work at all.

The theory was discussed at some length, together with the various criticisms the publication of the theory had called forth.

It was pointed out that the term physiological selection, as applied to the phenomena detailed by Romanes, is not a distinctive term, the definition of the term physiology showing that it deals only with the actions of living beings or their surroundings, and the effect of the surroundings on the living beings.

Finally, it was suggested that, instead of considering "physiological selection" as a *new factor* in the evolution of species, it should be ranked as one of that class of phenomena, called by Darwin "variation," and that the law of variation should be subdivided into the following groups:

A. Variation caused by isolation and migration.
B. Variation caused by climate.
C. Reproductive variation.
D. Correlated variation.

BRITISH OAK-GALLS.

SYNOPSIS OF LECTURE BY G. C. BIGNELL, F.E.S.

(Read December 23rd, 1887.)

Mr. Bignell remarked that it was very interesting to observe the different forms of galls. The most extraordinary thing in connection with them is, that eighteen species were known to produce two distinct forms—one generation producing males and females, and the next females only. Not only was there a difference between the gall-flies, but also a very great difference between the galls, so much so that the two species were separated and placed into two genera. These galls were drawn—highly magnified, to illustrate the lecture. One familiar species was that of the common oak-apple, perhaps better known as King Charles's apple (*Spathegaster terminalis*). This gall was produced at or near the end of a branch. The flies from these galls are of both sexes; the female deposits her eggs on the rootlets of the oak, and the gall formed is very much like a small potatoe; from this gall females only (*Biorhiza aptera*) are produced, and, strange to say, are perfectly wingless, and by a general observer would be taken for spiders. In conclusion Mr. Bignell summarised the oak-galls known in England, and stated that they were to be found on the root, bark, bud, leaf, and catkin.

The following list of the British oak-galls is arranged in a tabulated form, to show the bisexual and unisexual forms—the unisexual form is opposite the bisexual form.

BRITISH OAK-GALLS.

GALLS PRODUCING MALES AND FEMALES.			GALLS PRODUCING FEMALES ONLY.		
SPECIES.	When and Where to be Found.	When Imagines Appear.	SPECIES.	When and Where to be Found.	When Imagines Appear.
* Spathegaster baccarum—*Lin.*	May; cat., leaf	June … …	Neuroterus lenticularis—*Olivier*	August; leaf.	March
* —— albipes—*Schenck*	Spring; leaf.	June … …	—— læviusculus—*Schenck*.	August; leaf.	March
* —— vesicatrix—*Schlechtendal*	June; leaf.	July … …	—— numismatis—*Ol.*	August; leaf.	March
* —— tricolor—*Hartig*	June; leaf.	July … …	—— fumipennis—*Hartig*	August; leaf.	March
* —— aprilinus—*Giraud*	Spring; bud.	May … …	Neuroterus ostreus—*Giraud*.	August	November
* Andricus noduli—*Hart.*	July; twig, leaf	September ?…	Aphilothrix radicis—*Fabricius*	July; bk., root	April
* —— testaceipes—*Hart.*	Summer; leaf	September …	—— sieboldi—*Hart.*	Autumn; bark	April
* —— gemmatus—*Adler*	Spring; bud.	July & Aug.…	—— corticis—*Lin.*	July; bark	April
* —— inflator—*Hart.*	Spring; bud.	June … …	—— globuli—*Hart.*	Autumn; bud	April
* —— curvator—*Hart.*	Spring; leaf.	June … …	—— collaris—*Hart.*	Autumn; bud	April
* —— pilosus—*Adler*	May; catkin.	June … …	—— fecundatrix—*Hart.* = —— gemmæ—*Lin.*	Aug. and Sep.; bud	April
* —— cirratus—*Adl.*	May; catkin.	June … …	—— callidoma—*Adl.*	July; bud	April
—— ramuli—*Lin.*	May; catkin.	July … …	—— autumnalis—*Hart.*	Autumn; bud	April
* Spathegaster taschenbergi—*Schl.*	Spring; bud.	June … …	Dryophanta scutellaris—*Sch.* = —— folii—*Lin.*	Sept.; leaf	November
* —— similis—*Adl.*	Spring; bud.	May & June…	—— longiventris—*Hart.*	August; leaf.	October
* —— verrucosus—*Schl.*	Spring; bud.	May & June…	—— divisa—*Hart.*	August; leaf.	October
* —— terminalis—*Fab.*	May; bud	July … …	Biorhiza aptera—*Fab.*	Autumn; root	Dec. & Jan.
* Trigonaspis crustalis—*Hart.* = * —— megaptera—*Panzer*	May; bud	June … …	—— renum—*Giraud*	August; leaf.	Dec. & Jan.
			*Cynips Kollari—*Hart.*	July & Aug.	Oct. & Nov. & foll'g July
These require further observation before they can be definitely placed under the head of "producing females only."			Aphilothrix solitaria—*Fonscolombe.*	Summer; bud	September
			—— glandulæ—*Schenck*	Autumn; bud	March
			* —— quadrilineatus—*Hart.*	May; catkin.	March
			* —— albopunctata—*Schl.*	June; bud	March
			*Dryophanta agama—*Hart.*	Summer; leaf	October
			* —— disticha—*Hart.*	Summer; leaf	October

Those with an asterisk (*) affixed are to be found in Cann, Bickleigh, or Shaugh Woods.

CONVERSAZIONE.

(6th January, 1887.)

For an account of this, see the Report of the Secretaries.

OUR WASPS.

SYLLABUS OF LECTURE BY G. C. BIGNELL, F.E.S.

(Read 13th January, 1887.)

Wasps: What are they? The gregarious and solitary. The sting. The classification. Neuration of the wings (illustrated). Hooklets of wings. Names of insects. Life-history of the gregarious wasp—egg, larva, pupa, and perfect insect. The food of the gregarious wasp. Homes and food of the solitary wasp. Balance of life. Parasites.

PRODUCTION AND TRANSMISSION OF ELECTRICAL ENERGY.

BY JOS. M. COON.

(Read 20th January, 1887.)

THE MARCHES TOWARD SCOTLAND;

OR, CHAPTERS FROM THE HISTORY OF A NORTHERN FAMILY.

SYLLABUS OF PAPER BY ARTHUR J. JEWERS, F.S.A.

(Read 27th January, 1887.)

DESCENT of the family of Eure from the Earls of Flanders. Review of Scotch history leading to the claim of King Edward I. to be its overlord.

Services of Sir John de Eure, the father, in the field and as a Commissioner in the consequent struggles of the Border warfare.

Services of Sir John de Eure, the son, as Warden of the Marches towards Scotland. Battle of Neville's Cross. Sir John de Eure, the grandson. Serves against Scotland. Has a grant of the manor of Ketnes, co. Forfar. Constable of Dover Castle.

Sir Ralph Eure, a Commissioner relative to a breach of the Treaty of Lenlingham—Scotch prisoners taken at Hambledon—and to treat with the King of Scots, after with the Duke of Albany. Serves in arms against Scotland.

Sir William Eure, a Lancastrian, attends the king to Normandy. Warden of the Marches and a Commissioner to treat with Scotland. At the battle of Agincourt. Sir Ralph Eure, Sheriff of Yorkshire. Slain at Towton on the Lancastrian side.

Sir William Eure, Sheriff of Yorkshire. Serves in arms against the Scots. Warden of the Marches. A Commissioner to treat with Scotland. One of the Council in the North.

Sir Ralph Eure, Sheriff of Northumberland and Yorkshire. William, Lord Eure. Knighted at Tournay. Captain of the Town and Castle of Berwick, a terror to the southern part of Scotland. Made a peer. Promised the lands of the Earl of Angus. Slain at the battle of Ancrum Moor.

Sir Ralph Eure, Constable of Scarborough Castle. Commander-in-Chief of the forces guarding the Marches. Destroys Melrose. Serves against the "Pilgrimage of Grace." Slain by the Earl of Angus at Pennier Haugh.

ON TIME.

SYLLABUS OF PAPER BY J. MERRIFIELD, LL.D., F.R.A.S.

(Read 3rd February, 1887.)

Measures of time. The natural ones are the year, the month, and the day. How governed. The lengths of the different years. Procession of the equinoxes. Leap year, and other modifications for regulating the year. The month: how used among the ancients. The seasons: the unequal lengths of, explained. The day: the lengths of the several kinds. The equation of time and its effects on local time. Connection between local time and longitude. Our chief timekeeper losing time. Causes for. International or universal time, and the prime meridian settled on at the Geodetic Conferences at Rome and Washington.

CAPITAL.

SYLLABUS OF LECTURE BY GILBERT SLATER, B.A.

(Read 10th February, 1887.)

Different methods of economic research. Definition of capital. History of capitalism in England. England in the fifteenth century. England in 1760. The Industrial Revolution between 1760 and 1800. Its effects: First, on the wealth; second, on the welfare of England. Practical conclusions. Biological analogy.

CHURCHWARDENS' ACCOUNTS OF ST. BUDEAUX.

BY JOHN WHITMARSH.

(Read 17th February, 1887.)

It is hoped that the substance of this paper will appear elsewhere.

THE COAL TAR INDUSTRY.

SYLLABUS OF PAPER BY T. H. HARVEY.

(Read 24th February, 1887.)

Its recent origin. Coal Tar Colors. Crude products of tar. Liquid Fuel. Saccharine and Salol.

RECENT DREDGING IN CATTEWATER.

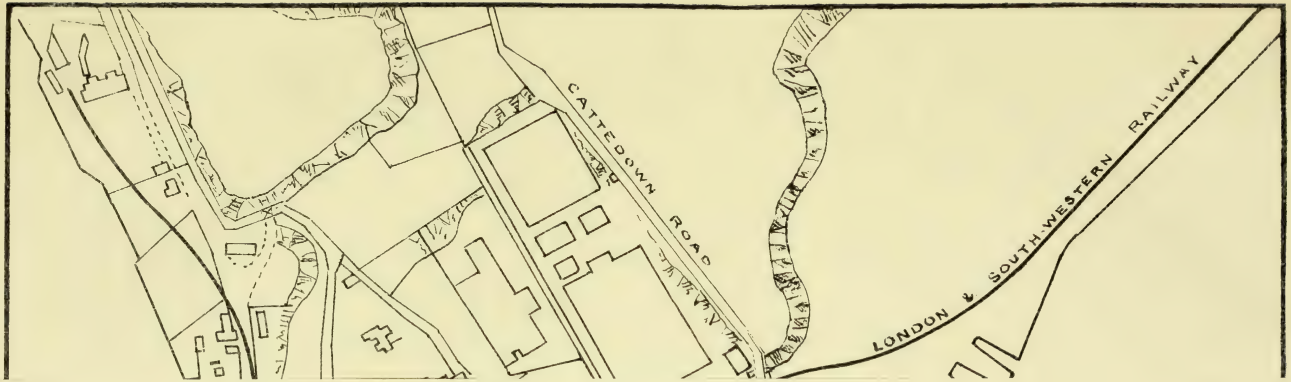
BY ROBERT BURNARD.

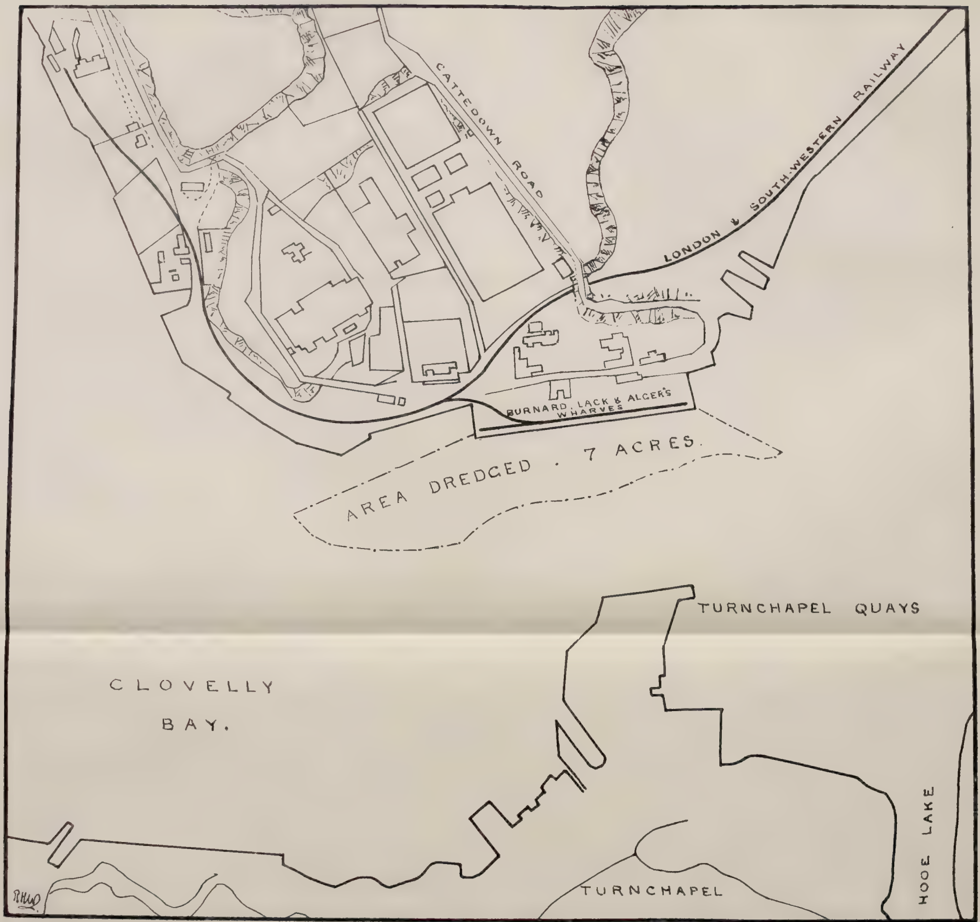
(Read March 3rd, 1887.)

When I was invited by the officers of this Society to read a paper, and thus initiate some useful discussion, I was most willing to comply with such an honourable request; but the difficulty of selecting a subject worthy of the traditions of the Plymouth Institution appeared to me to be very great. At the time the invitation was given I was actively superintending extensive dredging operations in the Cattewater, and this, on account of what appeared to be some interesting peculiarities of the silt, and the find which was unexpectedly made of the remains of an old ship, deeply embedded in the bottom of the harbour, determined me to select the dredging operations as the topic for this evening's paper.

It is not my intention to attempt to describe the commercial aspect of the subject. It will suffice if I state that the plant employed consisted of a powerful two-ladder dredger, driven by an engine of forty horse-power, nominal, and five hopper barges, with a carrying capacity of over one thousand tons. The time occupied in the work was six months, and the quantity of silt, rubble, and rock removed and discharged beyond the Admiralty limit outside the Breakwater was nearly one hundred and fourteen thousand tons. The area dredged in front of and contiguous to the Cattedown wharves amounted to about seven acres, and the greatest depth obtained was twenty-four feet at low-water ordinary spring tides.

It is necessary, in order to thoroughly understand what the Cattewater was really like in early times, to study some of the historical facts so carefully collected by Mr. Worth and others. The area of the harbour was formerly more extensive than it now is. In the Middle Ages it is said to have extended as far as


CATTEDOWN ROAD
LONDON & SOUTH-WESTERN RAILWAY


CATTEDOWN ROAD
LONDON & SOUTH-WESTERN RAILWAY
BURNARD, LACK & ALGER'S WHARVES
AREA DREDGED · 7 ACRES.
TURNCHAPEL QUAYS
CLOVELLY BAY.
TURNCHAPEL
HOOE LAKE
RHW

Plympton Castle, and we know that as late as two hundred years since barges reached the quay by Plympton St. Mary Church. The Black Prince, when here in 1348, proceeded by boat from Plymouth, or Sutton, as it was then called, to Plympton, for the purpose of dining with the prior.

The capabilities of the port were fully recognised by this prince, for here were his headquarters, when over three hundred ships were fitted out for his operations against France. In his person the first Duke of Cornwall was created, and to him were given those rights of foreshore and fundus which have so hampered and delayed modern enterprise.

The former connection between Plympton and maritime affairs is demonstrated by the fact that two hundred and fifty years since it furnished one letter of marque to the total of sixty-five Plymouth ships fitted out during the wars between this country, France, and Spain.

Lipson Mills stood at the head of a tidal creek, and Chelson Meadows were mud-flats covered with each tide. Plymstock, Oreston, and Hooe were anciently places of some importance, Turnchapel being more modern; Cattedown was undeveloped, and appeared to be a sort of Tom Tiddler's ground, mostly known as a place of execution for criminals, and a convenient spot for burning old women with the evil eye.

Captain James Grant, R.N., writing in 1814, states that he had discovered traces of a connection between Sutton Pool and the Laira. Burt says the connection was nearly a direct one east to west, and plainly discernible in most places even by a common observer. That the waters of the Laira, he says, made a considerable advance towards the lane leading from the turnpike-gate in the new road to Cattedown, previous to the formation of the Embankment, must be fresh in the memory of almost every inhabitant of Plymouth.

In like manner the tide, which fills Sutton Pool at this time, makes an approach towards the above-mentioned lane as far at least as the Pottery, by an arm proceeding from the square of the Pool. From the Pottery to where the waters of the Laira did flow, prior to the Embankment, lies the line or bed of junction which, with but very trivial obstruction, is nearly straight, and a hollow level the whole of the way from the Pool to the Laira. The re-opening of this line of communication was seriously discussed early in the century, with the formation of dry docks throughout the course of the canal.

It is highly probable that in ancient times this communication was utilized for the conveyance of merchandise, and was a waterway to and from the upper waters of the Laira to the convenient shipping port now known as Sutton Pool. It was a more secret, secure, and shallow passage than the open and more boisterous Cattewater, which at times might have been unsafe; for in the ninth century the open estuaries of the West were haunted by the piratical Vikings in their "snakes" or long ships; they knew, as did other adventurers long before their time, the metallic riches which Dartmoor streams yielded to the ancient miners.

The fundus of the large area below Laira Bridge has never been seriously disturbed, although attempts have been made from time to time to remove rubble, &c.; for it was ordered early in the seventeenth century that every Plymouth lighter and sand-barge should each year take away a load of rubble, &c., from Cattewater, and deposit it on the southern part of the fretted neck of land called Haw Stert; *i.e.* the Batten Isthmus. This had a double effect; namely, the deepening of the Cattewater, as well as the better defence of the Batten Isthmus against the ravages of the sea.

Before the Breakwater was built this was a most serious matter, and the danger to Cattewater was undoubtedly appreciated by our ancestors, who, in addition to the above precaution, built a wall on the isthmus facing the Sound; but, as recorded in Burt's *Review of the Commerce of Plymouth*, published in 1816, "time and heavy seas and gales of wind have made great inroads into the field, and the writer is convinced that, if it be not soon repaired, a communication will be made in the course of time with Catwater to the ruin of the harbour." The final and subsequent completion of the Breakwater in 1841 has apparently removed all anxieties in this quarter.

In the reign of Queen Anne, a statute for the preservation of the haven of Plymouth became law. The principal object of this Act was the removal of the Middle Bank, situated close to the entrance of the Cattewater.

At the commencement of the recent dredging the silt raised appeared to be ordinary black mud, which slipped from the buckets readily enough when tilted over the shute carrying it into the hopper barge; but as the machine bit deeper into the fundus the character of the silt appeared to change, and it clung with such tenacity to the buckets that much of it slipped overboard after passing the shute, and some buckets would carry round their burdens for several revolutions of the ladder, so tightly was the material lodged in the same. The deeper the digging the more compact and tenacious it became, until at times as much as fifty per cent. would slip overboard, involving double labour in going over the same ground again, and bringing to the surface for the second time the loosened and redeposited material.

The colour of the silt was dark slate, and so tenacious that it appeared to consist largely of clay. On drying the colour became greyish, and the material was so fine that, rubbed between the finger and thumb, it had all the characteristics of precipitated chalk. Under the microscope it was readily seen that the bulk of the material was extremely fine granite sand—quartz, mica, and felspar—and thinking it might have some small commercial value, I forwarded a sample to Messrs. Chance, the eminent glass manufacturers, who informed me that it was not suitable for their purposes. I tried brickmakers as well, but they replied that they possessed better materials nearer at hand.

The chemical examination disclosed the following composition:

SAMPLE DRIED AT 100° C. (212° F.).

	Per cent.
Organic matter and loss on ignition	10·13
Silica SiO_2 as sand	48·45
Silica combined, and as silicic acid	8·75
(Total silica, 57·20)	
Iron-ferric oxide $Fe_2 O_3$	4·13
Alumina $Al_2 O_3$	10·50
Lime CaO	8·33
Magnesia Mgo	1·63
Alkalies, carbonic acid, &c.	8·08
	100·00

The principal peculiarity is the very fine state of the subdivision of this material, samples of water with the silt in suspension taking many days to settle and clear. A sample of the silt amounting only to 0·05 per cent. was shaken in salt water; it partially cleared in three days, the remainder keeping in suspension, and sticking against the sides of the vessel; half per cent. in distilled water only cleared after remaining in rest for fourteen days. This accounts for its presence so far down the northern shore of the harbour, where the ebb is the slackest, all the grosser particles being deposited in the more immediate settling-bed formed by the Upper Laira.

The magnitude of this latter settling is appreciated when it is borne in mind that the yearly quantity of sand removed by barges for building purposes must be from 50,000 to 100,000 tons. Notwithstanding this annual removal, the deposit is increasing, especially with china-clay, and barges now occupy double the time in "getting" a cargo of clean sand to what they did formerly. Such is the testimony of barge-masters; but I will at present express no opinion on this important matter, as I have made no surveys or experiments so far up the estuary.

How long this sand-silting has been going on is, of course, unknown; but that at one time silt must have been deposited at a rapid rate, is evident from the appeals made to Parliament in Henry VIII.'s reign by West-countrymen, "to acte concernyge the amendynge and mayntenaunce of the havens of Plimouth, Dartmouthe, Teygnmouth, Falmouth and Fowey, in the counties of Devonshyre and Cornewall, piteously sheweth and complayneth unto the kynge our soveraigne lord, and to the lordes spiritual and temperall and the Commons in this presente parliament assembled . . . for where before this tyme all the maner of shyppes being under the portage of 800 tonnes resortynge unto any of the sayde portes or havens myght at the lowe water easely enter in to the same and there lye in suretie, what wynde or tempeste so ever dydde blowe . . . whiche sayde portes and havens been at this presente tyme in maner utterly decayde and destroyde by meanes of certayne tynne workes called Streme workes used by certayne persones within the sayde counties, whiche persones more regardynge theyr owne private lucre than the commonwelth and suretie of this realme, have by workynge of the sayde streme works, dygging, serchynge and washynge of the same . . . . conveyed by the force of the sayde ryvers a mervalyous great quantite of sande, gravell, stone, robell, erthe, slyme, and fylth, so filled and choked the same that nowe a shyppe of a hundred can scantly entre at the halfe floude to the decaye and utter destruction of the sayde havens and portes, and also to the ruyne, and utter undoynge of all the good townes within the sayde counties of Devonshyre and Cornewall, if remedy be not in that case spedely provyded."

It was therefore enacted that the malpractices of these unpatriotic persons should be dealt with by Parliament, and that stream works should no longer be permitted unless the said "dygger, owner, or washer, shall make or cause to be made sufficyente hatches and tyes in the end of theyr buddels and cordes" to intercept the "sayde stones, gravell, and robell," on pain of imprisonment.

As the officers of the Stannary were carefully excluded from this Act, it is very doubtful whether much benefit was derived from it, since surveys were repeatedly made in the earlier half of the seventeenth century, with the view of the preservation of Cattewater.

The vestiges of ancient stream works are scattered all over Dartmoor, indicating most clearly the extensive nature of the operations; and in no part is this more clearly shown than in the vicinity of Har Tor, where, in addition to evidences of a British settlement, consisting of hut-circles and avenues, are to be found the ruins of miners' huts, and smelting-houses, almost concealed among the huge boulders which form one of the most romantic river-beds on the Moor.

What with stream-tinning and mining, the rivers must have been veritable puddles, carrying down to the havens, in addition to the natural flood-wear of the soil and rocks, large daily contributions of "erthe, slyme, and fylth."

There is no doubt that a great deal of the Cattewater silt is due to old mining operations, and especially so is this true of the silt found far down the harbour; for, in confirmation of this, I may mention that it contains distinct traces of tin.

Thinking that some idea of the amount of suspended matter in measured quantities of the water of the harbour, might be of some interest and possible utility, I have had a series of samples taken at half tide, on both the ebb and flow, at certain fixed points; viz., the east and west ends of the Cattedown Wharf.

PARTS PER 100,000.

DATE.	EAST END SURFACE.			EAST END, 12 feet from bottom.			WEST END SURFACE.			WEST END, 12 feet from bottom.			STATE OF TIDE.
	Mineral.	Organic.	Total.	Mineral.	Organic.	Total.	Mineral.	Organic.	Total.	Mineral.	Organic.	Total.	
JAN. 11 .	20·34	3·4	23·74	24·26	3·68	27·94	17·512	3·4	20·912	21·528	3·712	25·240	½-*Flood*, 4.0 p.m.
,, 14 .	8·716	1·336	10·052	5.16	·984	6·144	7·312	1·224	8·536	3·216	·60	3·816	½-*Ebb*, noon.
,, 17 .	5·448	·912	6·36	...	...	2·360	4·532	·86	5·392	3·104	·52	3·624	½-*Ebb*, 3.30 p.m.
,, 24 .	4·016	·844	4·86	2·604	·796	3·400	2·656	·624	3·280	2·608	·588	3·196	½-*Flood*, 3.0 p.m.
,, 25 .	17·808	2·472	20·280	21·496	3·264	24·760	6·832	1·128	7·960	4·392	·896	5·288	½-*Ebb*, 9.30 a.m.
FEB. 4 .	3·644	·736	4·38	2·760	·456	3·216	4·584	·86	5·444	3·60	·636	4·236	½-*Flood*, 10.45 a.m.
,, 4 .	4·928	·84	5·768	14·052	1·68	15·732	6·452	·82	7·272	20·108	2·024	22·132	½-*Ebb*, 4.30 p.m.
,, 8 .	4.14	·76	4·90	11·04	1·58	12·62	...	...	...	11·896	1·60	13·496	½-*Ebb*, 9.0 a.m.
,, 8 .	1·332	·328	1·66	...	...	...	...	...	...	4·872	·92	5·792	½-*Flood*, 3.0 p.m.

These figures show great variation in amount of suspended matter, mineral and organic.

The mean organic matter half-flow tide is 1·498 per 100,000 parts.

The mean organic matter half-ebb tide is 1·302 per 100,000 parts.

The greater amount in the incoming tide is probably due to the sewage outfall in Deadman's Bay.

Half-flood Tide.—The total mean suspended matter on the surface at the

East end . . .	8·660	per 100,000	parts.
West end . . .	9·878	„	„

As the east and west ends are 100 yards apart, 1·218 parts in 100,000 had apparently settled whilst travelling that distance.

Half-ebb Tide.—The total mean suspended matter on the surface at the

East end . . .	9·472	per 100,000	parts.
West end . . .	7·290	„	„

So that on the ebb 2·182 per 100,000 parts is apparently deposited.

Half-flood Tide.—Twelve feet from bottom the total mean suspended matter at the

East end . . .	11·518	per 100,000	parts.
West end . . .	9·616	„	„

This is reversing the usual order; for the west end should be more than the east end.

Half-ebb Tide.—Twelve feet from bottom the total mean suspended matter at the

East end . . .	14·323	per 100,000	parts.
West end . . .	9·671	„	„

It will be necessary to extend these experiments before anything very definite can be learnt from them. Observations made when heavy freshets are coming down will be especially valuable.

Cattewater compares favourably, as regards suspended matter with some other tidal and fresh-water rivers.

Total matter in suspension per 100,000 parts.

Cattewater (half-flow)	9·802
,, (half-ebb)	9·815
Thames (low-water)	50·000
,, (high-water)	20·000
Mississippi	80·000

The Ganges varies from 20 to 200 parts per 100,000. It is stated that the suspended matter discharged annually into the sea by this river is equal to forty thousand million cubic feet of clay.

The Cattewater appears to have within it two elements of danger—one is the sewer outfall in Deadman's Bay, and the other is the reported increase in the deposit in the Laira. If this goes on unchecked, the channel will be narrowed, and, with a swifter current running on the ebb, the deposit will be carried lower down, to the prejudice of the harbour.

The Cattewater Commissioners should at once have cross sections of the harbour taken at certain fixed points, and sound them periodically. They would then know exactly what is taking place in the bottom of the harbour, and would possess a record of the utmost value for reference.

What certainly appeared to me to be most singular was, up to a certain point, the non-discovery in the dredged material of any curiosities in the shape of relics of the past. The only objects detected up to the point where the mooring-chain crosses the harbour were two tobacco-pipes of eighteenth-century shape, and a pewter spoon, bearing the effigy of Queen Anne.

On dredging westward of this, and after removing some of the surface-silt, a serious obstruction was encountered, necessitating the utmost care in the manipulation of the dredger.

It was discovered, after removal of some of the surface, that pieces of timber were sticking up through the silt; and what was at first considered to be the remnants of perhaps some foundered barge soon developed into the remains of a large ship.

The position of the wreckage was twenty feet west of the Cattewater mooring-chain, and twenty feet south of the line of the Cattedown wharves, with the stem pointing towards Cattedown.

The length of the wreck appeared to be about eighty to ninety feet, and prior to dredging it was entirely covered by silt.

Before disturbance by the dredger, the timbers were framed and in place, just apparently as she lay when misfortune overtook her. A considerable portion of the keelson was recovered, buried ten feet under the surface of the mud.

The removal of this timber was very troublesome and difficult, delaying operations; for after each assault of the dredger, the detached portions had to be found by a diver and brought to surface. In this manner a barge-hold full of various sorts and sizes of oak and beech was collected.

Resting on the wreck was a large amount of ballast, consisting of large, heavy, water-worn pebbles and flints. It was estimated that about 240 tons of the former and ten tons of the latter were dredged and discharged into the hoppers.

I am indebted to Mr. G. F. Watson for a shipbuilder's opinion on the timber. He reports examining stem, keelson, with mast-step and many floors, futtocks, timbers, and planks, of rough workmanship. Abundance of timber was evidently used in the construction, the scantlings being sufficient for a craft of 300 tons register, according to modern rules; the room and space 23 to 24 inches from the seating of the floors, roughly chipped out of the dead wood. All the timbers are English oak, and the planking beech, of 2½ inches, or half an inch to three-quarters of an inch less than modern requirements; the keelson 14 inches sided, and about the same moulded. The floors were evidently attached to the keel with iron bolts, but no other portions seem to have been connected with iron. The probability is that the vessel was comparatively short, deep, and broad, and the longitudinal was apparently deemed of second consideration to the transverse strength. The heavy framing may have been required from the rough way in which it was put together. Timbers are not well squared, and scarphs short in stem and keelson. No chocks appear to have been used.

After expressing his inability to determine the age of the ship, Mr. Watson considers the wreck to represent a vessel of about 300 tons burthen—not a man-of-war, and of no great age; but how she became buried so deep in the silt is a problem he consigns to the tender mercies of geologists.

Fortunately for the peace of mind of these gentlemen, evidence has been fished up which indicates that the age of the vessel is about 250 years. This is borne out by Mr. Watson's description of the timbers; and his opinion that the vessel was comparatively short, deep, and broad, and of great transverse strength, thus enabling it to carry with greater security the enormously high stern superstructures in vogue both in men-of-war and merchant ships of the seventeenth century, tallies with this estimate of the age.

These superstructures were formed by two and three terraced decks, springing from the upper deck abaft the mainmast, and were used as living quarters, and for the lighter ordnance.

The ballast-pebbles are heavy, and composed of an exceedingly hard stone. They have been examined by Mr. Worth, who pronounces them to be granophyre, a felspathic rock, somewhat akin to granite, evidently coming from some shore where the cliffs were formed of this rock. Mr. Worth says, "I am not aware and cannot discover that it forms part of the coast anywhere in England. It does occur at Mull, and other places on the west coast of Scotland; but the examples I have thence do not agree with this. There is, however, the bay called Carlingford Lough, in Ireland, and that seems a very likely spot, though I have seen no example of the granophyre from that locality. Most of the Continental localities, at any rate, are inland, and I know of none on the coast; but the rock is of somewhat wide distribution, and no doubt occurs in such situations, probably in the north of Europe. It occurs in England, at Carrock Fell, in Cumberland; but that is inland. Carlingford seems the most probable locality. The flints are chalk flints, not greensand, and may have come from many places."

The quantity and character of the ballast clearly indicates a vessel of some importance, and the latter most probably points to the presumption that she was not a local craft.

Warships, owing to their heavy top-hamper, carried enormous quantities of ballast, and it is significant that for this purpose shingle was employed.

Whether built or not for a man-of-war pure and simple cannot, of course, be actually determined; but all large vessels, whether trading or otherwise, were very fully armed; and that this vessel was capable of acting as a warship may very reasonably be inferred.

That she is a relic of the great storm of 1824 may be dismissed at once. Her construction, ballast, depth in silt, and position, all point to an earlier period. Not a trace of anchors or cables came to light. The only discoveries made *in situ* were a wooden block, the remains of a wooden shovel, and a round copper cover. The former were nearer the surface, but the cover was found ten feet below the harbour level of the silt. It has the appearance of, and was probably used as, the cover of a magazine, perhaps containing loose powder.

As the dredger dug among the ruins, dispersing them—rolling timber forward and spreading it over a larger area, occasionally bringing up some portion of the wreck—a sharp look-out was kept for anything that might turn up that would throw some light on this long-forgotten relic of the past.

When hope was almost abandoned, the buckets fished up what appeared to be a mud-laden piece of timber, which fell with a thud on the shute, and fortunately rolled from it on to the deck of the hopper. A slight examination discovered the small cannon now exhibited; and after a thorough cleansing and examination this was found to be a cast-iron gun marked with the letter P, and its weight 1 cwt. 0 qrs. 3 lbs. The total length of the gun is 2 feet 9¼ inches; diameter of bore, 1¾ inches. Greatest circumference of muzzle, 15 inches; smallest circumference, 11½ inches; circumference at vent, 17½ inches. Present weight, 110½ lbs., or 4½ lbs. less than original weight.

On probing the bore, it was found to be loaded; and with some patience oakum wadding, a cast-iron ball of just half a pound weight, more wadding, and the remains of a powder charge, consisting of charcoal and sulphur (all the soluble nitre being, of course, washed out), were extracted.

The identification of the period of the gun was somewhat difficult, owing to the scarcity of seventeenth-century examples in any of the museums in London. I searched the Tower, British Museum, and the Royal United Service Institution Museum unsuccessfully; but on proceeding to the Rotunda, the Museum of Artillery at Woolwich, I found ample material to work upon.

The earliest known example in this country of a piece of ordnance containing cast-iron in its construction is a wrought-iron bombard of 15-inch calibre, containing an inner cast-iron tube. It threw stone shot of 160 lbs. weight, and is at least as old as the earlier portion of the fifteenth century. It was found in the moat of Bodiham Castle, Kent, and was preserved for many years at Battle Abbey.

The earliest whole cast-iron gun was found in the Medway, near Chatham, and is believed to be amongst the first of the cast-iron guns of the latter part of the reign of Henry VIII., about 1540.

There is a brass culverin in the Museum of Elizabeth's reign with the inscription, "Henri Pit made this pece 1590," and it is generally considered that this founder was the originator of the series of cast-iron muzzle-loaders which came into general use during this period.

There is also a cast-iron gun, with a calibre of 4¼ inches, weighing about 40 cwt., marked "W. P." This is supposed to be another maker of the same name who flourished later.

It is extremely probable that the small gun we are now examining was manufactured by this family. In the Museum there are many examples of cannon of the early seventeenth century type very similar in shape to this. One, a brass falconet of the time of the Commonwealth, 3 feet 9 inches long and of 2 inches calibre, and a cast-iron gun of the same time, 3 feet 2 inches long and 3 inches calibre, are almost, as regards shape and style, exact counterparts.

This sufficiently identifies the age of the cannon dredged from amongst the ruins of the old ship, and a vessel with such a type of ordnance may reasonably be connected with the same period. That it contained heavier metal is apparent when one studies the armaments of seventeenth-century ships.

As is the case now, warships carried ordnance of various sizes, to suit the fancy of the time and the various parts of the ship. Thus the *Royal Prince*, built in 1610, carried 55 guns, disposed as follows. On the lower deck: six demi-cannon, or 32-pounders; two cannon-petronels, or 24-pounders; and twelve culverins, or 18-pounders. On the upper deck: eighteen demi-culverins, or 9-pounders. On the forecastle and quarter-deck: sakers, or 5-pounders; and guns of the lightest description, some mounted on swivels or peeping through small ports on the highest deck, for use against boats, or for sweeping the decks of an enemy at close quarters.

These small guns are, properly speaking, little falconets, but were popularly known as "murderers," probably for the reason that a recoverable wound was possible from a musket ball, but a dose of half a pound of cast-iron was calculated to produce sudden death.

The *Sovereign of the Seas*, built in 1637, was unequalled by any ship afloat in her time. She possessed three gun-decks, and carried no less than eighty-six guns, the lower decks accommodating the heaviest; whilst the upper gun-deck carried the lighter ordnance, and on her quarter-deck and forecastle, we are informed, "were numbers of murdering pieces." This demonstrates the fact that large ships carried, in addition to heavy guns, the very light kind of artillery now before you. Bearing in mind that this was charged with powder and shot drives us to the conclusion that the vessel carrying it inside the harbour must have been engaged in actual warfare, since the gun has evidently been dismounted by a longitudinal shot; for on examination it is clearly seen that it has received on one side a heavy blow on the muzzle, trunnion, and breech.

Shipping played no unimportant part in the Civil War operations in the West. Ruthven, after his defeat at Bradock Down, retired on Saltash, and, according to Clarendon, "cast up such works, and planted such store of cannon upon the narrow avenues, that he thought himself able, with the help of a goodly ship of four hundred tuns, in which were sixteen pieces of cannon, which he had brought up the river to the very side of the town, to defend that place against any strength was like to be brought against him." But the Royal Cornish drove him out with much execution, capturing all his ordnance and the goodly ship, Ruthven barely escaping to Plymouth by boat.

On the next recorded occasion—namely, the Royalist rout at Freedom Fields, on Sunday, the 3rd of December, 1643—the defeated forces attempted to cross Lipson Creek, when Parliamentarian ships stationed at Laira Point opened fire on them, and not a few were killed. Seven months later a Parliamentary fleet visited Plymouth, the flagship being the *James*, of 1200 tons, carrying in supreme command Admiral the Earl of Warwick. Mention is made by Whitelock of the fleet lying in Cattewater, and he bears testimony to the gallantry of the crews of these ships, who formed a naval brigade, and especially assisted the garrison in repelling a desperate attack made by the Cavaliers on the western defences in September, 1644. The same authority states that the town was relieved by a naval force under Captain Swanley, a seaman of great repute, who for his services received the thanks of Parliament and a gold chain of £200 value; and there is no doubt that this fleet played an important part in the subsequent action against Mount Stamford.

When Grenville resumed operations against the good old town after one of the pauses in active siege work, he seized under cover of the night the abandoned ruins of this fort, and proceeded to repair and re-fortify it. This was more than the garrison could stand, as the position was considered to be one of prime importance, and they forthwith, we are told, under cover of the fire of sixty guns from the ships and forts, "beat up the dust about the Cavies' ears," attacked and carried the fort by assault.

In fact, naval operations are repeatedly mentioned, and as the Cavaliers at one time held possession of the whole south side of the Cattewater, including a fort supposed to have been near Hooe, called Fort Arundel, it is too much to suppose that such close quarters resulted in damage to one side only, but that ships as well as forts must have suffered from the battering of culverins, demi-culverins, sakers, and the brood of other murdering pieces. The old ship we have been discussing was probably one of these. Receiving serious injury she was run ashore under cover of the guns of the Cattedown work, dismantled, all her guns and gear removed, and the superstructure carried away down as far as low-water would permit. She was in shallow water, clear of the channel, and would be of no inconvenience or danger to navigation. There, with her ballast sitting heavily on her, or at least what remained of her, she slowly sank in the mud, and was gradually covered up by the natural tidal silt, and the operations of the busy stream-tinners who vigorously fouled the Dartmoor rivers down to the time of Queen Anne.

If acceptable, I have much pleasure in offering these relics to the Council, to be placed in the Museum as a tangible reminder of a very glorious page in the history of Plymouth.

THE VOYAGES OF SIR FRANCIS DRAKE.

SYLLABUS OF LECTURE BY W. H. K. WRIGHT, F.R.H.S.

(Read 10th March, 1887.)

GENERAL interest in Drake's history of late. His position as Navigator. Naval Commander and Engineer. Testimony as to the importance of Drake's national services. Reputed piratical proclivities. Early voyages. Voyage to the West Indies and Spanish Main, 1572–73. "The famous voyage of Sir Francis Drake into the South Sea, and therehence about the whole globe of the earth, begun in the year of our Lord, 1577." Drake's home-coming after the voyage of circumnavigation. Results of the voyage. Commercial results. Some points of Natural History first made known by Sir Francis Drake. Voyage to the West Indies, 1585–6. Expedition to Cadiz, 1587. Spanish Armada, 1588. Expedition to Corunna, 1589. Drake's last voyage and death, 1596. His general character. Eulogiums paid to his memory.

NOTES ON REVENUE-RAISING.

SYLLABUS OF PAPER BY R. H. Mc CARTHY.

(Read 17th March, 1887.)

A WISE system of taxation is necessary to the prosperity of a community. Examples of over-taxation. Contributions to revenue may be in money, kind, or labour. Examples of revenue-raising among the Romans and other ancient peoples—the Aztecs and Incas in Europe in the Middle Ages, &c. Sketch of English taxation—under Romans, Saxons, and Plantagenets. Origin and rise of Customs duties. Benevolences. Poll-taxes. Monopolies. Ship-money. Excise founded. Land tax. Tax on newspapers. Duties on marriages and on bachelors. Increase of taxation during wars of last century. Pitt's taxes. Zenith reached in 1815. Spread of Free-trade ideas, and consequent wholesale repeal of Customs duties. History of taxation of last forty years one of reduction and abolition. Some stamp and license duties of to-day. A word about foreign and colonial finance. Theory of taxation. Adam Smith's maxims. Objectionable taxes. Examples. Conclusion.

THE GROWTH OF OUR COLONIAL EMPIRE.

SYLLABUS OF LECTURE BY FRANK PHILLIPS, F.R.C.I.

(Read 24th March, 1887.)

THE British Empire: As it was fifty years ago, and as it is in the present day. Its area and population. Comparison of the increase of trade of the Empire during the past fifty years. The products of the Colonies and British Possessions. Railways, telegraphs, and means of communication. Governments. Imperial federation. Emigration. Position of Plymouth in relation to the Colonies.

ON THE OSTEOLOGY OF RISSO'S GRAMPUS.

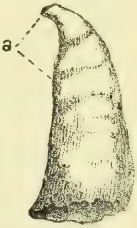
(Grampus Griseus.)

BY F. H. BALKWILL.

I HAVE prepared, articulated, and added to the Museum the entire skeleton of the Risso's Grampus reported last year. The skeleton is, I believe, perfect, with the exception of the pelvic bones, which were very small, one tympanic bone, and four teeth, which have been reserved for examination. One tympanic bone is still attached to the skull for reference, and the place of the absent teeth is supplied by plaster models. Considering that this specimen is unusually interesting, I shall give it a full description.

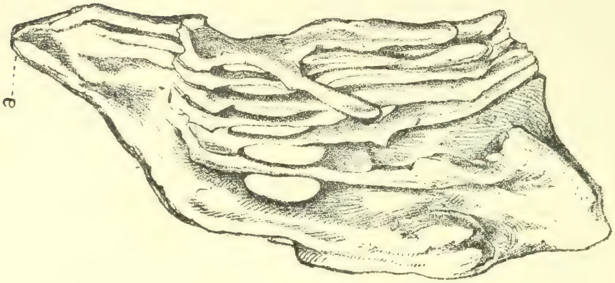
Skull: Length, 1 foot 6 inches; Width, 1 foot. A symmetrical septum of nostrils being three-quarters of an inch to the left of central ridge of occiput.

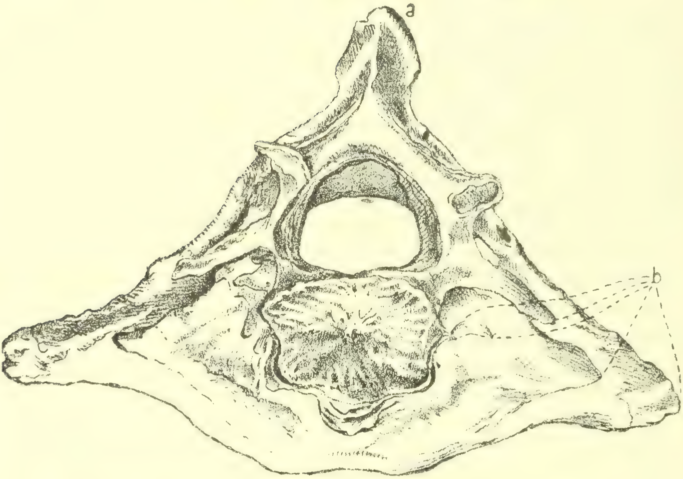
Lower jaw nearly as long as upper. Teeth, $\frac{0 \cdot 0}{3 \cdot 3}$. Length, from an inch to an inch and a quarter. Width at base, about half an inch. Conical, curved, with a slightly oval section, very hollow, with enamelled crowns (*a*) for nearly half an inch, which were more curved than the general curve of the tooth; points slightly worn.



The backbone consists of sixty-one vertebræ, of which the following is a description: The seven cervical vertebræ are all anchylosed together at the top of the neural arch; but the lateral processes are quite distinct, and the bodies, although very close, appear to be separated by articular cartilage. That an animal with so short a neck should still so distinctly show the mammalian typical number of cervical vertebræ is so interesting that a drawing is appended.

CERVICAL VERTEBRÆ.





The Atlas, more massive than the other cervical vertebræ:

	in.	lines.
Width across lateral processes	7	6
Depth	4	6
Second cervical vertebræ . . width	5	6
Third, fourth, fifth, and sixth (which have lateral processes quite distinct) . . . width	3	0
Seventh has longer and more spiny lateral processes .	4	0

TWELVE THORACIC VERTEBRÆ.

	in.	lines.
First (width across lateral processes) . . .	4	3
Second (width across lateral processes) . . .	5	0
From which they gradually narrow to the seventh, which is	3	9
Whence they widen again to the twelfth, which measures across	8	0

SEVEN DORSAL VERTEBRÆ.

From the thoracic vertebræ there are seven to the motor axis of spine, which I have reckoned as dorsal vertebræ, as here the spine is nearly perpendicular, the general inclination of the spines being towards it on both sides.

FOURTEEN LUMBAR VERTEBRÆ.

The next fourteen vertebræ having no inferior chevron, I have considered lumbar.

TWENTY-SEVEN CAUDAL VERTEBRÆ.

The first nineteen of the remaining vertebræ have hæmal chevrons attached to the inferior surfaces of the intervertebral discs by cartilage. The depth of these commences at an inch and two lines, gradually increases to two inches and nine lines at the fourth, continues about the same to the ninth, when it gradually diminishes to the last, which is only three lines high.

These chevrons, with their spines, nearly reproduce in shape the neural arch and spine on the vertebræ above them.

At the seventh caudal vertebra their bodies begin to get more massive, and deeper than wide; and at the twelfth the lateral processes are almost obliterated.

The six caudal vertebræ are perforated in the body on each side, just above the lateral processes. These perforations, which are repeated in all the vertebræ to the end of the tail, approach more and more to the top of the body, till, in the eighteenth and to the last, they are quite on the upper surface, on each side of the spine or centre. The bodies of the vertebræ are compressed laterally to the eighteenth, which is nearly cylindrical, from which to the last they are compressed horizontally.

LENGTH OF NEURAL SPINES.

The neural spines are very short at the neck; their measurements will be given from above the neural arch:

	in.	lines.
Spine of cervical vertebræ (points backwards) . . .	1	3
First thoracic (vertical)	0	9
Second ,, (points forward)	0	9
Third ,, ,, ...	0	9
Fourth ,, (points backward) . . .	1	0

Spines gradually increase in height to the sixth dorsal, or nineteenth, four inches, from which they gradually decrease in height to the eighteenth caudal, where all indication of spine over neural foramen ceases.

WIDTH ACROSS LATERAL PROCESSES:

	in.	lines.
Atlas	7	6
Seventh cervical	4	6
Second thoracic	5	0
From which the width gradually diminishes to the seventh thoracic, which is	4	1
Eighth thoracic	5	9
From which they gradually increase to the first dorsal, which measures	8	9
Nearly same width to second lumbar	8	0

from which it gradually diminishes to the tenth caudal, after which there is just an indication of a transverse process for three more vertebræ.

Between all the vertebræ were intervertebral plates, each composed of two nearly circular discs of bone, with a cushion of cartilage between them. The surfaces of these discs, which were very irregular and denticulated, articulated very exactly with the bodies of the vertebræ between which they were placed.

RIBS.

Twelve pair. Anterior rather broader and flatter than the posterior, which were more slender.

First rib, measuring round the bend, 10 inches, gradually increasing in length to the sixth, which was 1 ft. 8 in. 3 lines.

The first six pairs of ribs articulated at two points with the vertebræ; viz., with the end of lateral process, and with the body.

The seventh right rib had a false articulating surface, like the preceding rib, but only articulated at one point.

There were seven pairs of false ribs and one odd one; but to which side this belonged there was nothing to show; the first three pair articulated with the sternum, the rest by cartilage.

STERNUM.

		in.	lines.
In two parts	complete length	7	9
Front plate (hexagonal)	,,	4	6
,, ,,	width	4	0
Posterior plate (quadrilateral)	length	3	3
,, ,,	width	2	0

HYOID BONE.

Composed of two boomerang-shaped masses, superimposed and connected in the centre by cartilage. Superior arch, composed of two bones; inferior, composed of three—a quadrilateral body and two wings.

SCAPULA.

		in.	lines.
Triangular	greatest width	7	0
,,	,, depth	9	2

Acromion and coracoid processes well developed.

HUMERUS.

Massive (cylindrical)	4	0

ULNA.

Length	3	9

RADIUS.

Length	4	6

Carpal bones tessalated in cartilage, with semi-lunar articulating discs between these and the bones of the forearm. The manus possess bones in only two digits; the third had seven phalanges, and the fourth six phalanges, with intermediate discs. The bones of the forearm were very similar to those of a porpoise, except the phalanges.

TIDAL AND GENERAL NOTES ON CATTEWATER.

BY R. N. WORTH, F.G.S.

(Read at the Anniversary Meeting, May, 1886.)

I AM indebted to Major Daubeny for the opportunity of examining an interesting MS. written in 1839 by a certain "J. B.," then residing at Stonehouse, and who from internal evidence as well as external was Mr. Blackburne, for some years lessee of the dock at Turnchapel, and the author of certain plans for the improvement of Sutton Pool, referred to in Burt's *Commerce of Plymouth.* Some of the notes contained in this MS. are of considerable value, especially those upon the tides at Plymouth, based upon a series of observations "carefully" made "and registered at Turnchapel in the harbour of Catwater during the several years of 1803, 1804, and 1805. This was about nine years before the first stone of the Breakwater in Plymouth Sound was deposited." The important portions of these observations are embodied in the following extracts:

"The two spring tides of each lunation flow to an unequal height, or one rises higher than the other, and there is a periodical alteration of when the highest of these two spring tides takes place. At one time of the year the full moon spring tides are higher than those of the new moon. At another time of the year the new moon spring tides are higher than those of the full moon. This alteration takes place at the winter and summer solstices. From January to July the new moon spring tide is the highest, and from July to January the full moon spring tide is the highest. The best spring tide rises 9 inches higher than the other, and falls 13 inches lower than the other. There is also a difference in the height of the rise of the tides in the morning and evening, and there is also a periodical alteration in this respect, which takes place at the spring and autumnal equinoxes. The morning tides are higher than the evening tides between September and March, and the evening tides are the highest between March and September. The tides are fifteen minutes longer in falling than in flowing.

"A north-east wind occasions the least rise and the lowest fall in the tides, and a south by west wind causes the highest rise and the least fall. A sudden increase in the density of the air . . . will diminish, check, or nip the rise of the tides. When there is a rise of one inch in the quicksilver, if such rise is sudden and rather local, the height of the tide at high water will in proportion be twelve inches less. It is a popular notion that frosts nip the tides, and it has been commonly observed that during a sharp frost the tides do not rise so high . . . the actual cause is the additional pressure of the atmosphere . . . the barometer usually ranging high during severe frosts.

"The same observation applies, only with a contrary effect, when the barometer falls suddenly . . . the tide in consequence rises so much the higher, and in the proportion before stated of one inch fall in the quicksilver to twelve inches increase in the rise of the tides.

"Whenever a new moon or a full moon occurs on or about the day of the spring or autumnal equinoxes, and the moon chances to be in apogee at the juncture, and two of the superior planets in ecliptic conjunction with her also, the quicksilver very low, and a hard gale from the south and by west blowing at the time, this port is sure to be visited by a very extraordinary inundating high tide—a tremendous flow of waters."

RISE AND FALL OF THE WATER AT THE BEST OR HIGHEST SPRING TIDES.

Moon's Age.	Time of High Water.	Time of Low Water.	Rise and fall of the Tides perpendicularly.	How much the water flows higher than at Neap Tides.	How much the water falls lower than at Neap Tides.
	h. m.	h. m.	ft. in.	ft. in.	ft. in.
Day of full and change	4.48 a.m.	11.6 a.m.	14 10	4 6	3 4
1st day after	5.28 ,,	11.47 ,,	15 9	4 9	4 0
2nd ,,	6.6 ,,	12.25 p.m.	14 0	3 10	3 2
3rd ,,	6.49 ,,	1.8 ,,	13 4	3 6	2 10
4th ,,	7.29 ,,	1.48 ,,	12 9	3 3	2 6
5th ,,	8.11 ,,	2.30 ,,	11 8	3 0	1 8
6th ,,	8.58 ,,	3.19 ,,	10 4	2 6	10
7th ,,	9.51 ,,	4.12 ,,	8 7	1 6	1
8th ,,	10.46 ,,	5.11 ,,	7 6	6	0
9th ,,	11.47 ,,	6.17 ,,	7 0	Dead of	the Neaps.
10th ,,	12.58 p.m.	7.26 ,,	7 1	0	1
11th ,,	2.7 ,,	8.31 ,,	8 4	1 2	2
12th ,,	3.6 ,,	9.26 ,,	9 7	1 9	10
13th ,,	3.54 ,,	10.12 ,,	10 9	2 3	1 6
14th ,,	4.30 ,,	10.48 ,,	12 1	2 10	2 3

RISE AND FALL OF THE WATER AT THE WORST SPRING TIDES.

Moon's Age.	Time of High Water.	Time of Low Water.	Rise and fall of the Tides perpendicularly.	How much the water flows higher than at Neap Tides.	How much the water falls lower than at Neap Tides.
	h. m.	h. m.	ft. in.	ft. in.	ft. in.
Day of full and change	4.48 a.m.	11.6 a.m.	13 1	1 11	2 9
1st day after	5.28 ,,	11.47 ,,	13 11	2 7	2 11
2nd ,,	6.6 ,,	12.25 p.m.	13 6	2 7	2 6
3rd ,,	6.49 ,,	1.8 ,,	13 2	2 7	2 2
4th ,,	7.29 ,,	1.48 ,,	12 4	2 3	1 8
5th ,,	8.11 ,,	2.30 ,,	11 2	1 11	10
6th ,,	8.58 ,,	3.19 ,,	10 6	1 7	6
7th ,,	9.51 ,,	4.12 ,,	9 5	9	3
8th ,,	10.46 ,,	5.11 ,,	8 9	4	0
9th ,,	11.47 ,,	6.17 ,,	8 5	Dead of	the Neaps.
10th ,,	12.58 p.m.	7.26 ,,	9 9	6	10
11th ,,	2.7 ,,	8.31 ,,	10 10	1 1	1 4
12th ,,	3.6 ,,	9.26 ,,	12 1	1 7	2 1
13th ,,	3.54 ,,	10.12 ,,	13 1	2 1	2 7
14th ,,	4.30 ,,	10.48 ,,	13 10	2 7	2 10

Mr. Blackburne has also recorded some interesting notes touching the encroachment of the sea at Mount Batten. For several years he occupied the field there as a place for laying timber. On the side of the field next the Sound the Admiralty had placed three upright stones "along the lowest part of the field, not far from the edge of the cliff . . . . with a view to ascertain the actual progress of the encroachment of the sea on the low neck of land in times to come. Fears were in fact entertained for the ultimate security of the harbour of Catwater, many acres having been washed away to the south-east of the old sea wall within the memory of man, and the soil being at length washed away from behind the sea wall. The wall itself from being thus left exposed to the depredation of the sea at high tides gradually yielded to it, and a great part of it had at the juncture been entirely washed away."

On the 24th December, 1807, Mr. Blackburne carefully measured the distances from the edge of the cliff to each of these stones. The distance from the edge to the north-westernmost stone was then 39 feet; to the middle stone 37 feet 6 inches; to the south-easternmost stone 26 feet 6 inches. Twenty-six years subsequently, September 6th, 1833, he found the distances to have decreased 4 feet at the north-westernmost stone, 3 feet 6 inches at the middle stone, and at the southernmost stone 9 feet 6 inches—the measured distances being respectively 35 feet, 34 feet, and 17 feet. "I observed also," he adds, "that in the course of these years nearly as much of the sea wall had been washed away as was left standing. In the course of time it will all go, and the low land be left to the mercy of the sea, the water at length make a breach over it, and eventually it may become similar to the bridge between Nicholas Island and Mount Edgcumbe."

Mr. Blackburn's prophecy has not been fulfilled, nor does it now seem likely to be. The completion of the Breakwater a few years later than his last observation has apparently removed all danger from that side; and it is not at all unlikely that the greater part of the waste he records had taken place in the earlier years of the period, before the Breakwater had begun to afford protection. The waste since 1833 cannot at any rate have been very serious, though its exact amount is not definitely ascertainable, and there is only a small fragment of the wall now (1887) left. Such encroachments as have taken place of late on the seaward face of the isthmus appear to be of a local and casual character. On the other hand there is ample evidence that a good deal of the low earthen cliff on the Cattewater side has been gradually wasted by the tide undermining the bank, and that this process is still in operation.

The bulk of Mr. Blackburne's MS. is occupied with a description of the Turnchapel Dock and the means adopted to make it watertight and available for occupation, the original arrangement being most defective. Probably the most practically interesting part in a scientific point of view is the description given of the rock in which it was excavated. From the head, half way toward the dock gates, it was cut out of schistose rock in which were numerous fissures pervious to water, containing loose soil and decayed slate. Further north, on the east in particular, there was loose slate. The ground under the apron was a sort of clay mixed with small pieces of decayed slate, and there was a good depth of it, excepting at and near the western pier, where the slate rock approached. The schistose rock was bounded both north and south by limestone. At about 60 feet from the head of the dock southward it joined the limestone, and at about 200 feet from the dock gates north-easterly limestone commenced again. "The northern side of the yard was once a steep lofty rock, high as a ship's masthead, and at its foot, about where the south building-slip now is, and toward the next slip, was a low neck of land across which the sea used to flow over at spring tides. The lofty rock being limestone of a different period of formation to any in the neighbourhood, and superior in quality to any thereabouts, it was in lapse of time all quarried away down to its present level."

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